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HUMAN BIOLOGY

a record of research

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CONTENTS

No. 1, January, 1929

PAGE

Foreword . . . . . *Raymond Pearl* 1

Is the Ape-Man a Myth? . . . . . *Henry Fairfield Osborn* 4

Studies on Constitution. I. Methods . . . . . *Raymond Pearl, Alan C. Sutton, William T. Howard, Jr., and Margaret G. Rioch* 10

Entrenched Negro Physical Features . . . . . *T. Wingate Todd* 57

Do Races Differ in Mental Capacity? . . . . . *C. B. Davenport* 70

The Sex Factor in Infant Mortality . . . . . *Harry Bakwin* 90

Biological Philosophy and Medicine . . . . . *George Draper* 117

Notes: A Note on the Mortality of Brewery Employees 136

Quotations: Mr. Cranium's Lecture. Eugenics Circa 590 B. C. 139

Recent Literature 144

No. 2, May, 1929

Is the Pro-Dawn Man a Myth? . . . . . *William K. Gregory* 153

Somatological Norms in Tuberculosis and Heart Disease . . *Albert G. Love* 166

Specific Vital Indices for Japan, 1925. . . . . *T. J. LeBlanc* 198

Some Landmarks in the Phylogeny of the Primates . . . . *F. Wood-Jones* 214

Biological Factors in Negro Mortality . . . . . *Raymond Pearl* 229

Social Selection and the Formation of Human Types . *Melville J. Herskovits* 250

Increase of the Negro Population in the United States . . . . *Mary Gover* 263

Notes: Nativity and Parentage of the Population of the United States and the Homicide Rate . . . . . *John R. Miner* 274

Congenital Anomalies . . . . . *R. J. Dittrich* 278

Quotations: Constitutional Somatology 283

Political Parsons. 284

Recent Literature 286

No. 3, SEPTEMBER, 1929

PAGE

The Spread of Generations . . . . . *Alfred J. Lotka* 305

The Inheritance of Pigmentation in the American Negro . . . *Irene Barnes* 321

Primogeniture and Developmental Anomalies. . . . . *Madge T. Macklin* 382

Reversion to Primitive Behavior Resulting from Organic Disease of the Brain *Walter Freeman* 406

Notes: Notes on Mongolian Craniology. . . . . *Truman Michelson* 421

An Anatomical Expedition to Africa 423

Quotations: Dr. John Cross on Physiognomy and Constitution 426

Recent Literature 431

No. 4, DECEMBER, 1929

The Sick Man. . . . . *Warfield T. Longcope* 445

Growth Changes in Physical Correlation—Height, Weight and Chest Circumference—Males . . . . . *Joseph Berkson* 462

Natural Selection in the Processes of Population Growth . . . . . *Warren S. Thompson* 503

Compulsions, Obsessions and Feelings of Unreality . . . . *Lloyd H. Ziegler* 514

The Point of Population Saturation. Its Transgression in Mauritius. . . . *D. Drysdale Anderson* 528

Ecology of American Notables . . . . . *Stephen S. Visher* 544

Notes. Perception and Language . . . . . *Grace A. de Laguna* 555

Changes in the Incidence of Mortality at Advanced Ages . *Raymond Pearl* 558

Church Membership and the Homicide Rate . . . . . *John R. Miner* 562

Quotations. John Hunter on Appetites and Aging. 565

Recent Literature 572

Index. 589

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Direct
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Vol. I No. 1

HUMAN BIOLOGY

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JANUARY, 1929

FOREWORD

In 1924 the writer published a book entitled *Studies in Human Biology*. Up to that time, so far as he is aware, these words had not been used as the specific label of a development in biological thought which had obviously been taking place over a considerable period of years. At least this specific label had enjoyed no wide currency up to that time. Since then it has.

The underlying thought which was crystallized in this label "human biology" was this: just as had been the parallel case in general biology, the separate special sciences which had for their subject matter the various biological aspects of human beings, anatomical, physiological, psychological, pathological, etc., were analytic rather than synthetic in their basic philosophy. This is the normal and necessary first stage of the development of all science. But it had for a long time been becoming more and more evident that the humanistic branches of knowledge and endeavor, sociological, economic, historical, political, etc., found it ever more desirable, and indeed necessary, to extend their roots down into the biological substrata of man's structure, personality, and behavior. To do this was difficult, and all too frequently led to absurd deductions, because the humanistic student lacked both a sufficient personal background, and available comprehensive sources, in the way of general biological synthesis, to enable him to put into proper order, and with critical distribution of emphasis, the analytic results which had accumulated in the special sciences devoted to the biology of man.

This journal HUMAN BIOLOGY is started as a modest contribution towards the meeting of the need which is implied in what has just been said. It will serve as a medium for the publication of results of original research in all fields of human biology, including physical and general anthropology, anthropometry, vital statistics, human heredity and eugenics, prehistory, human anatomy, sociology, constitutional pathology, and psychobiology. At the present time the papers which

are contributing to the rapid development of human biology have necessarily to seek publication in various special journals, anatomical, statistical, anthropological, medical, hygienic, etc., where the main concerns of the special journal, and the interests of its clientele, are not primarily *biological*, in a general, synthetic sense, but are those of the special field concerned. It seems likely to be a real advantage to human biology to have a medium of publication which will bring together this literature now so widely scattered.

English will be the sole language of the journal. Acceptable contributions in other languages will be translated into English before printing. There will be no reviews. In each number there will, however, be a list of new books and memoirs which have been received at the Editorial Office. In some measure these lists will serve as current bibliographies.

Other departments of the journal, which will appear more or less regularly, will be, first, a section headed *Notes*, in which will appear brief contributions—fragmentary data not worth more extended presentation, but warranting record. Second, there will be a department headed *Quotations*, the basic purpose of which will be to enliven the journal, and also to aid in the cultivation of historical mindedness. Any honest person will admit, I think, that scientific journals are, at the best, occasionally dull, and, at the worst, always so. Why this should be is hard to understand. Science is in reality the most vividly interesting and fascinating thing in the world. Why should its exposition so usually be made so dreadfully tiresome? The editors of HUMAN BIOLOGY will constantly strive to make the contents thoroughly readable, clear, and, so far as our contributors will lend their aid through the brilliancy of their ideas and the charm of their writing, entertaining.

The basic criteria for the inclusion of all material in HUMAN BIOLOGY, except in the departments of *Quotations* and *Current Literature*, will be that the contribution must embody the results of original research, in which thinking is included; and that it must have some general *biological* interest and significance, however slight, rather than the exclusively special interest of some other particular science.

A good deal of attention has been paid to the designing of HUMAN BIOLOGY, in respect of paper, typography, head and tail pieces, and the cover. In this the editors have enjoyed the hearty and efficient cooperation of the publisher. We all think that no harm will be done if HUMAN BIOLOGY presents an attractive mien. The *Leitmotif* of

the decorative scheme throughout is the little bowman, who will at once be recognized as an old friend by all students of prehistoric art. His original delineation appears upon the wall of a rock shelter a few miles north of Alpera, a small town in the southeastern part of Spain. The little group of four very human beings in the center of the headpiece is redrawn, in slightly modified form, from a seventeenth century Japanese map of the world, recently described by Prof. Dr. Karl Hagen of the *Museum für Völkerkunde* in Hamburg. They are supposed to represent Lapps. The drawings for the cover and other designs were made by Mr. Arthur Johansen, the staff artist of the Institute for Biological Research, to whose skill and artistic sensitivity we are greatly indebted. The cover design itself embodies the ideas and suggestions of the editor, assistant editors, Dr. Adolph Schultz and Mr. Johansen.

RAYMOND PEARL

IS THE APE-MAN A MYTH?

BY HENRY FAIRFIELD OSBORN

Research Professor of Zoology, Columbia University; Honorary Curator of Vertebrate Palæontology, American Museum of Natural History

The problem of the ancestry of man occupies the central or pivotal point in all the problems of human anatomy, physiology, psychology and ecology. If we are truly descended from ape-like ancestors not very remote from the chimpanzee who inhabited warm, tropical forests, who had recourse in danger to the nearest tree, whose fore-limbs were greatly lengthened for the limb-swinging or brachiating habit, whose hind limbs were relatively shortened, who habitually walked on all fours and only occasionally on their hind limbs, the palms of whose hands were tipped with incurved fingers, whose thumbs were greatly reduced—then every reaction, every instinct, every habit, every reflex of our higher and lower cerebral centers would be vaguely reminiscent of these warm, forest-living ancestral conditions.

Until the year 1924 I was myself entirely of this mind, accepting the opinions of my colleagues, especially of those who were meeting the fundamentalist assaults on Darwin's great work, *The Descent of Man*, by new anatomical evidence. In fact, my implicit faith in the ape-man theory reached its culminating point in a series of superb papers before the New York Academy of Sciences, by Gregory on the teeth, by Morton on the foot, by Tilney on the brain and by McGregor on the general anatomy, which, combined, seemed to entrench Darwin's hypothesis of 1871 beyond the possibility of a doubt. As I listened to these splendid original dissertations, each representing years of prolonged research, I had a profound wish that Darwin or Huxley could have been present to enjoy this apparently complete confirmation of their theories.

DIFFICULTIES OF THE APE-MAN THEORY

The only misgivings I had at the time were those of the human palæontologist closely familiar with all the anatomical details of discovery during and even prior to the Old Stone Age. These mis-

givings arose from two indisputable facts: first, that the limb proportions of all the primordial races of man—the Trinil, the Neanderthal, the Cro-Magnon—had not revealed a trace of ape ancestry; they were one hundred per cent pro-human; they were indicative of long legs and short arms. Despite the chimpanzee-like resemblance in the beetling brows of the Neanderthal and the Trinil races, the femora in both these races told a different story, and the very specific name *erectus* applied by Dubois to his *Pithecanthropus* made a contradiction in physiological terms, for *Pithecanthropus* signifies "ape-man," whereas *erectus* signifies a non-ape-man.

The second line of misgivings arose through direct and indirect evidence afforded by the fossil hands of two finely preserved specimens of the Neanderthal race. These hands were one hundred per cent human; they had well developed thumbs; they had distinctly man-like and not ape-like fingers; they were capable of fashioning not only the coarser but the finer tools which were used and which were gradually evolved during the long Neanderthal human stage, now estimated at nearly 500,000 years.

But for the ape-man theory as applied to the origin of the human hand, a still greater blow was in store in the discovery of varied and well fashioned flint implements of far antecedent closing Pliocene age, in fossil mammal beds along the southeast coast of England known as the Red Crag; these flints were conservatively estimated by geologists at 1,250,000 years of age. To be sure, they afforded only circumstantial or indirect evidence as compared with the direct evidence afforded by the complete bones of the Neanderthal hand, but these varied Red Crag flints have the counter advantage of a two-edged sword: first, they demonstrate the possession of a perfectly formed hand with a well formed grasping thumb, with deft fingers guided by a clever and designing mind lodged only in a large forebrain. In brief, they lend no support to the ape-man theory and they thrust back the separation point between man and the other primates into the remote Oligocene past, far beyond any previous calculations or estimates.

THE CRADLE OF MAN

In this somewhat divided state of mind, strongly inclining toward the ape-man hypothesis but with some misgivings on the score of limb proportions, of structure of the hand, of the tool-making capacity of the brain, I accompanied Roy Chapman Andrews on a rapid

reconnaissance journey into the very heart of the Desert of Gobi. Carefully trained to observe and to reconstruct past conditions from geological and palæontological data rapidly traversing in the course of ten days five or six hundred miles of the now bare and desert but formerly hospitable country, I suddenly found myself forming an entirely new concept of human origin, namely, that the actual as well as the ideal environment of the ancestors of man was not in the warm forested lowlands of Asia or of any other continent, but in the relatively high, invigorating uplands of a country such as central Asia was in Miocene and Oligocene time—a country totally unfitted to any form of anthropoid ape, a country with meandering streams, sparse forests, intervening plains and meadow lands. Here alone are rapidly moving quadrupedal and bipedal types evolved; here alone is there a premium on rapid observation, on alert and skillful avoidance of enemies; here alone could the ancestors of man find the materials and early acquire the art of fashioning flint and other tools.

These conclusions and others too numerous to mention in detail sent me back to Peking a complete convert to an entirely new concept of the ecology or environmental conditions of primitive man: he could not have been a forest-liver; he could not have inhabited a warm tropical country; he could not have learned to fashion tools where no flints or rocks capable of being shaped into tools were to be found; he could not have preserved and improved by intelligently directed use the marvelous powers of the human thumb unless opposed to the flexible fingers. Immediately I announced my conversion before the assembled scientists and naturalists in Peking from all lands, but not until three years later, on April 29, 1927, on the occasion of the two hundredth anniversary of the foundation of the American Philosophical Society, was I able seriously to formulate a new theory of the plateau origin of man and to challenge the Darwinian hypothesis not only in its original form but in its highly developed modification refined by the wealth of recent discovery in which it has been expressed by such great anatomists and anthropologists as Sir Arthur Keith and my own colleague William King Gregory. In the few lucid intervals which I have been able to devote to this anthropological avocation in the midst of an extremely busy life, I have taken up one aspect of this subject after another; I have held a running debate with all my colleagues, none of whom, with the single exception of Tilney, is inclined to agree with me; I have sought the aid of Dubois, Tilney and McGregor in the remeasurement of the Trinil brain; I

have learned from Dietrich of Berlin that the Trinil ape-man is not an ancestral link, as all of us have supposed, but a surviving, non-progressive, forest-living offshoot of some very ancient early human stock shut off from competition in the southernmost forests of Asia where food was plentiful, and that it thus affords convincing illustration that ancient and conservative types can survive only when they are shut off from competition with progressive and more adaptive stocks and when they are sheltered in warm, tropical, forest-clad regions.

The Trinil ape-man is thus dethroned from its once proud position as a Pliocene prototype and takes its place beside a few remnants of the more ancient palæontological world which were harbored in forests.

PHYLOGENETIC PRINCIPLES

Phylogeny, the study of plant and animal, including human, lines of descent, is an extremely difficult science, the chief principles of which have been entirely revealed to us since Charles Darwin's time and even since Huxley's time, although Huxley in one of his famous addresses laid down some of the most important canons of phylogenetic research. For my present position in human phylogeny I have had almost unrivaled training in fifty years of research among the lower primates—the horses, the rhinoceroses, the titanotheres, and, recently, the proboscideans. From this experienced standpoint the phylogenetic ideas of the Darwinian, and even the Huxleyan, period appear almost puerile; Huxley's attempt at the phylogeny of the horse, in which he mingled the ancestor of more than one kind of quadruped, is an illustration of the pitfalls that beset even the greatest comparative anatomists prior to the modern palæontological period, wherein we are able to trace the closely successive stages of modification step by step in respect of every single character of the teeth and skeleton and to show the plastic influence of habit, of habitat, of response to various kinds of environment favorable to the development of certain proportions and organs and unfavorable or actually repressive to others.

One of the first lessons derived from this palæontological discipline, as well as from contemporary advances in the science of heredity, is that *an ancestral form must have one hundred per cent of the characteristics and potentialities of development which are observed in its descendant.* Put to this acid test, no form of ape, living or fossil, nor any kind of ape specialized to the tree-living, brachiating habit, even in an early stage of ape development such as is hypothesized by recent

distinguished theorists like Keith and Gregory, does possess one hundred per cent of either the adaptations to habit and to habitat or the potentiality for future evolution of such marvelous organs of modern civilization as the human hand, such pilots of activity as the human brain, such incentives to ideation and invention as confronted our ancestors in a plateau habitat, or, finally, such proportions of the limbs and such structure of the foot as would enable man to compete in flight with other bipeds and even with some of the swifter quadrupeds.

For all these reasons and many others which I hope to elaborate and set forth in a special volume, I have finally come to the conclusion that the ape-man is a myth, that all the evidence along so many lines of comparative anatomy, of physiology, of biochemistry, of psychology, of reproduction, are instances either of a prolonged common inheritance of characteristics distinctive of all the *Primates* or of parallelisms and analogies of adaptation due to the common possession by man, certain of the monkeys and all of the anthropoid apes, of certain family and social characteristics and traits. Many of the resemblances that have been pointed out as proofs of direct ancestry of man and the anthropoid ape stock are simply proofs of common inheritance and of originally close kinship. The survival through heredity of these common traits for a period of even 20,000,000 years should not surprise us in the least when we have in other members of the animal kingdom survivals of common traits extending back 500,000,000 years through stabilized conditions of heredity. In fact, no useful characteristic in any animal or plant is ever lost; it is, on the other hand, carefully conserved. But useful characteristics like the adaptive thumb and deft fingers, which beyond challenge belong to the primitive human stock, if once lost through even the early stages of adaptation to the limb-swinging, brachiating habit of the ape, can never be regained.

As in similar phylogenetic controversies and discussions in the field of embryology and comparative anatomy, the last word certainly belongs to only one science, and that is the science of palæontology. While I am myself absolutely convinced that the ape-man is a myth, just as the Lamarckian theories of heredity are now proving to be myths, although once of worldwide acceptance, I do not expect to convince all my opponents until what I believe to be prototypes of the Dawn Man, namely, pro-human bipeds with well developed hands and with promising brains, are actually discovered in plateau regions.

This plateau region in all probability will be central Asia, although the plateau region of central Africa should not be neglected when searching for this most interesting of all missing links, the pro-Dawn Man, which leads us to the summit of animal creation.

STUDIES ON CONSTITUTION. I. METHODS[1]

BY RAYMOND PEARL, ALAN C. SUTTON, WILLIAM T. HOWARD, JR., AND MARGARET G. RIOCH[2]

HISTORY

The purpose of this paper is to describe in detail the methods for the study of human constitution in relation to disease, now used in the Division of Human Genetics of the Institute for Biological Research of the Johns Hopkins University and the Constitutional Clinic of the Division of Medicine of the Johns Hopkins Hospital. It seems advisable to do this at the present time for two reasons. The first is that in a number of respects the details of the technique we are using in constitutional studies are original, inquiries regarding them are constantly coming in, and it is economical of effort to describe our present technique once and for all in systematic published form. In the second place the time is approaching when we expect to begin the publication of some of the results which have been obtained in this work, and again it will be economical of effort to have the necessary description of technique already on record.

Before beginning the discussion of the technique it is desirable to give some account of the history of the present organized program of research on constitution in the Institute for Biological Research. The senior author embarked upon the intensive study of human genetics and constitution some ten years ago, soon after coming to the Johns Hopkins University. Two lines of approach were at that time undertaken. The first of these was by the collection of an extensive series of family records, by a staff of trained field workers, which could then be subjected to various sorts of genetic and statistical analysis. The problem which occupied the central position in this project was the relation of constitutional and environmental factors to the incidence of tuberculosis, but a large amount of information along similar lines was collected regarding a number of other diseases.

[1] From the Institute for Biological Research of the Johns Hopkins University.

[2] With the assistance of Frank Smith, Jr., and Mary Helen Baker.

The carrying through of this large project was made possible by grants generously donated by the National Tuberculosis Association, the Russell Sage Foundation, and the Commonwealth Fund. This collection of Family History Records, as it is officially designated in our publications, furnished a unique and massive source material for various problems in human genetics and constitution. A considerable number of studies based upon it have already appeared (21–33)[3], and others will be published as time goes on.

The second approach to constitutional problems was through the biometrical study of the autopsy records of the Johns Hopkins Hospital. After this work had proceeded some way a grant was obtained in 1923 from the then existing Committee on Human Migration of the National Research Council, which materially facilitated its progress. A number of papers have been published regarding this work (34–43), which is still going forward.

When the Institute for Biological Research was established in 1925 an integral part of its organization was a Division of Human Genetics for the study primarily of the constitutional factor in disease. At the outstart the work was inaugurated in a modest way, attention being confined to one problem, the constitutional factor in the etiology of essential hypertension. At the same time that the Division of Human Genetics of the Institute was organized there was also set up the Constitutional Clinic in the Johns Hopkins Hospital, the actual working staff being the same individuals in both cases.

The plan from the beginning was to bring to bear upon the problem of the constitutional factor in disease a combined attack from the standpoint of clinical medicine, anthropometry, and genetics. The first year's experience, besides furnishing much valuable technical information as to how research on the constitutional factor in human disease could best be prosecuted to give critical and significant results, also demonstrated that the general plan of a coordinated three-fold approach was sound. Studies on constitution in relation to disease which either wholly neglect or seriously subordinate any one of the three lines mentioned must inevitably fail to lead to critical and comprehensive insight into the problem. But it was also evident that such an approach necessarily demands a larger organization and ampler resources than were contemplated in our original plans. There must be available full-time clinicians, and trained field-workers,

[3] Throughout this paper numbers in parentheses refer to the list of literature cited at the end.

besides the necessary technical office assistants. Furthermore the scope of the work should be wider than is implied in a single disease entity.

The facts regarding the development of this work were laid before the Rockefeller Foundation for consideration in the early autumn of 1926. In November that Foundation very generously made an additional grant to the University for the purposes of the Institute. This grant, which became available on January 1, 1927, made possible a considerable expansion of the work.

ORGANIZATION

It has already been mentioned that our work on human genetics in relation to disease has a threefold basis in

A. Clinical Medicine and Pathology,

B. Anthropometry,

C. Genetics.

All of the work is organized on this tripodal base, which we regard as fundamentally important. From the standpoint of methodology what we are trying to do is to discover qualitatively, and measure quantitatively, the relation between the *organization* of an individual, in the Aristotelian sense, and the pathology exhibited by the same individual at the time the study is made. Clinical medicine, of course, is our only available method of getting data as to the individual's pathological condition, so long as he remains alive. These data will be more valid, the more exact and refined the clinical technique brought to bear upon the problem. Without the slightest desire to criticise anyone, and with full recognition of the practical considerations which have been determinative in producing the situation, it is an entirely fair statement of fact to say that a great part of the studies which have been made by eugenists upon the inheritance of disease in man, are open to criticism in respect of the adequacy of the clinical medicine and pathology involved. There is a dearth in such studies of precise and penetrating medical information.

Laycock (17), in beginning his lectures on constitution, said (p. 1):

> Another division of physiognomical diagnosis is that by which the constitution of the patient is determined, that is to say, the particular mode, in or by which things or conditions specially influence his or her recovery from disease. This kind of diagnosis is the foundation of Rational Medicine as opposed to Empiricism, and has always had the attention of the most eminent Physicians in every

age, from that of Hippocrates downward. For it is the most common observation, that the same exciting cause of disease, or the same remedy, operates very variously upon different individuals, even of the same age and sex. *Now, as this difference of action can only depend upon differences in the individuals, the cause being the same, it soon becomes an object of inquiry in what respects individuals differ, and to classify them according to their resemblances and differences.* (Our italics.)

This is as adequate a statement today as it was when Laycock made it, of one important aspect of the biological philosophy underlying the investigation of the constitutional factors in disease. What such investigation seeks to do is to discover the biological differences between individuals, and to correlate these with the manifestations of disease. When Laycock wrote in 1862 it was deemed sufficient to evaluate somatological differences qualitatively. Both biology and medicine have advanced since then, and now nothing short of quantitative methods will do. Careful measuring, conforming in its technique to the highest standards set by physical anthropology, is an absolute requirement of critical work on human constitution. This has been generally recognized in recent work in this field, particularly by German and American workers, perhaps less so by the French. Beneke (2), who was a pioneer in the exploration of constitutional pathology, from the beginning of his work emphasizes "die hohe Bedeutung anthropometrischer Untersuchungen" in this field.

After the measurements are made it is essential that they should receive adequate statistical treatment according to modern biometric standards. In this particular a great deal of the work which has been done upon constitution is open to criticism. Data are collected with the utmost pains to ensure the very highest degree of accuracy possible, and are then subjected to statistical analysis so feeble, so inadequate, and altogether so lacking in grasp and penetration as to nullify substantially all of the previous labor that has gone into the work, so far as concerns any real advancement of knowledge.

The genetic leg of the tripod which supports constitutional studies rests upon the fact that whatever is *constitutional*, that is, determined by the innate organization of the individual, must have heredity as one element, at least, in its determination. As Beneke said in 1878 (1, p. 247):

Diese eben erlangt durch meine Beobachtungen eine ungeahnte Erklärung, denn wir wissen, wenn auch nicht das Wie? und Warum?, doch zweifellos, dass alle anatomischen Eigenthümlichkeiten des Organismus dem Gesetze der Erblichkeit unterliegen.

It is quite true that we do not yet know either the "how" or the "why" of the details of human inheritance, for any but a very few characteristics indeed. Just this fact of ignorance is in itself one highly important reason for carrying on thorough and comprehensive investigations in constitutional pathology.

Anything approaching a thorough and comprehensive study of the genetic side of the problem has hitherto been conspicuously lacking in a great deal of the otherwise high grade work on constitution. Valuable as it is, in the present state of knowledge, to have thorough clinical and anthropometric studies of single individuals, obviously an important element in the whole picture is lacking when no study whatever is made of the *family* to which the patient belongs. Suppose one succeeds in distinguishing a particular somatic type. What we want to know is as much as possible about how it was that that particular person came to have that particular type of bodily organization. Any such knowledge is manifestly impossible without a thorough study of the genetic background.

To summarize the discussion up to this point it may be said that what we have tried to do in planning and carrying on our investigations in constitutional pathology is to bring together into one integrated and coordinated working research unit the basic elements clinical medicine and pathology, anthropometry, and genetics, which represent the minimum epistemological requirements for really critical work on this subject. Many will regard another element which we have omitted entirely as also belonging among these minimum requirements. We refer to the psychological element, or, as it has been called by Draper (9) the "psychiatric panel." The prominence which this element has had in modern constitutional work arises, quite simply, we think, from two considerations: first the personalities, and second, the objectives, of a good part of the men who have been the leaders in such work. Kretschmer (16), who is an outstanding figure, Bleuler (4–7), Beringer (3), and Wertheimer (44), are psychiatrists by profession. In general, their problem—their focus of interest—has been "the relation between human form and human nature." If the object of study is the whole human personality, the psychological is surely just as important, perhaps more so, than the purely morphological aspect.

Our investigations have purposely been restricted to a narrower field, not because of any lack of interest in or appreciation of the importance of the larger one, but for purely practical reasons. To add

psychological examinations and measurements to our other procedures described in this paper, and do equally thorough work, would enormously add to the complexity and expense of the investigation. Furthermore, from a methodological standpoint, human personality as a whole is a very large order indeed. There would seem to be something to be said for the plan of undertaking one part of the problem at a time. Thinly spread butter yields less vitamin A per loaf of bread consumed than a more intensive application.

With so much by way of discussion of the theoretical side of the organization of the work, a word may be said as to the personnel problem. Experience has convinced us that the minimum requirements for the successful prosecution of research in this field are the following:

Two physicians, one male and one female, working on a full-time basis, who make the examinations, measurements, and photographs of the patients in the hospital, dispensary, and, to some extent, in the homes.

One field-worker, on a full-time basis and provided with an automobile.

One general supervisor and office director of the work on a full-time basis, who should have had a thorough training in, and a knowledge of, both medicine and statistics. In any form of research which involves the cooperative effort of several individuals, who are, however, always actually working separately, central coordination of the effort is imperative. Some one must make it his business to keep track of each case as it develops, see that no individuals in the pedigree are missed, and that all required records are filled or a reason stated for the failure.

Over and above the minimum personnel, as many more clinicians, part or full-time, computors, anthropologists, and geneticists may be added as funds and space permit.

An important feature of the work is repeated scrutiny of a case while it is in active work, before it is regarded as closed and bound. In our work not only is each case carefully gone over repeatedly by the physicians and field workers, and by the office supervisor (W.T.H.), but finally it is brought up at a regular weekly staff conference, at which time the general director of the whole investigation (R.P.) goes over the whole with a critical eye, questioning every doubtful point, and frequently turning the case back for further work.

All of this is, of course, preliminary to detailed genetic and biometric analysis of the results. Nearly all of our work at the present time, and the whole of the present paper, represents the data collecting stage of the investigation. The analysis of results will come at a later stage.

SELECTION OF PATIENTS

All our patients are drawn primarily from the wards and dispensary of the Johns Hopkins Hospital.

The physician in charge of the division (A.C.S.) and the male and female assistant physicians are also members of the clinical service of the Department of Medicine and conduct the Constitutional Clinic of the dispensary. They have at their disposal a special room in the dispensary (Fig. 1) for the examination and photography of the patients. As a matter of routine policy all males over eight years of age are examined by one of the male physicians and all females over that age are examined by the female assistant physician.

Every family studied is entered through a patient chosen for some particular reason. The completed case embraces this person and his family. The records of the family unit are bound together. Each family studied receives, when taken on, a serial number by which it and all its members are followed, and under which data pertaining to them are filed and indexed. Each member recorded in a family receives also his own number within the family.

Up to the present time the diseases which we have chiefly studied are:

1. Hypertension.
2. Syphilis.
3. Cancer.
4. Acute nephritis.
5. Allergic diseases.
6. Hodgkin's disease.
7. Tuberculosis.
8. Various familial and constitutional anomalies and diseases, taken on mainly because they have been the subject of genetic study by previous workers, and are generally regarded as hereditary ailments.

Within each of these disease groups the choice of particular patients is random. We take what offers within our field. Before work is begun upon a patient a careful explanation is made of the character

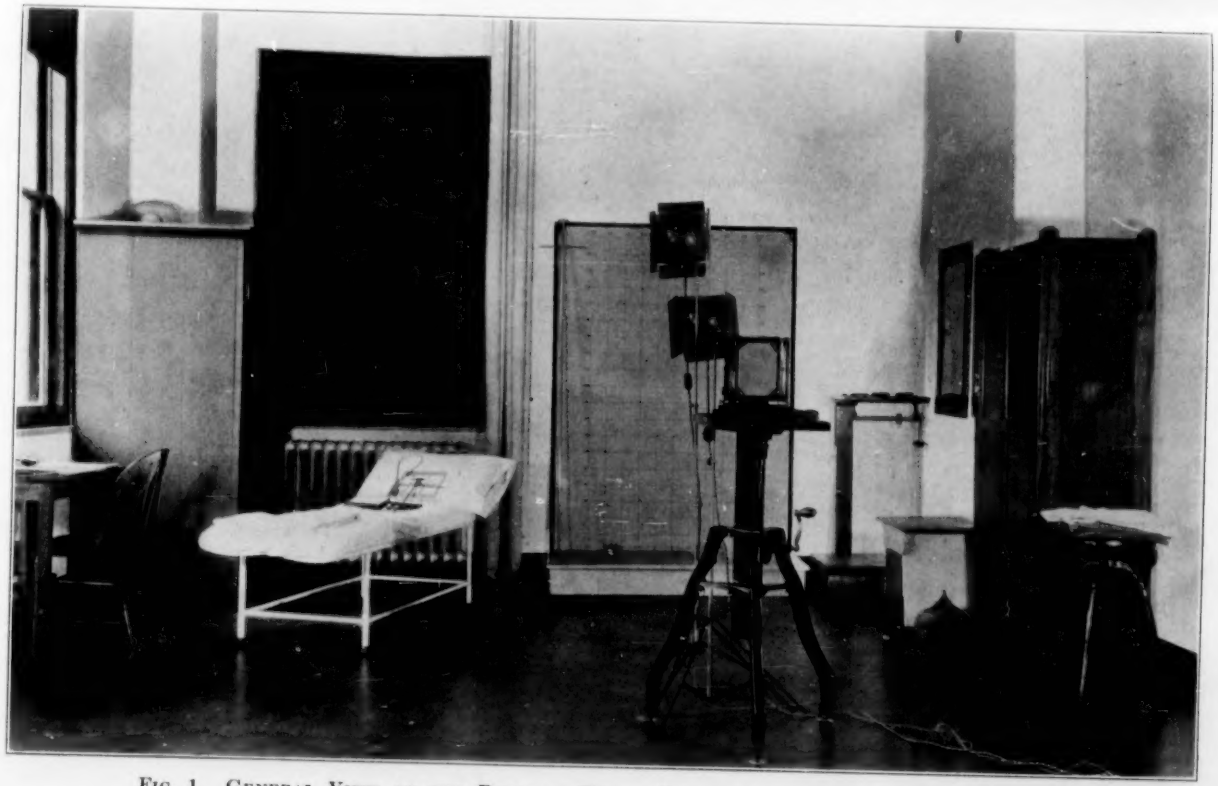

FIG. 1. GENERAL VIEW OF THE ROOM IN WHICH PATIENTS ARE EXAMINED AND MEASURED

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and scope of the examinations which will be made, and the consent of the patient is gained in advance.

Table 1 shows the extent of the collection of material up to date.

TABLE 1

Cases studied up to November 1, 1928

DISEASE	NUMBER OF CASES (PATIENTS)			TOTAL NUMBER OF PERSONS IN PEDIGREES
	Males	Females	Total	
Hypertension	40	113	153	8,483
Acute nephritis	6	4	10	360
Cancer	30	11	41	2,761
Gastric ulcer	3	0	3	159
Asthma	3	3	6	174
Syphilis	30	26	56	2,669
Hodgkin's	0	3	3	99
Hereditarily transmitted abnormalities of development	8	8	16	982
Miscellaneous	3	9	12	704
Totals	123	177	300	16,391
In work	...	...	42	
Total cases	...	...	342	

A word may perhaps usefully be said about difficulties which experience has brought to light in getting and handling patients for constitutional study. The most outstanding one, in our experience, is that which inheres in the recent immigrant family. Such a family, which has been in this country less than the period of a whole generation, presents two serious difficulties. The first concerns language. Some members of the family, particularly the older ones, are sure to speak no English, and to understand it only imperfectly. The resources of the present investigation are not great enough to permit the employment of physicians and field workers speaking a variety of east European languages. And it *is* difficult, under such circumstances, to get much useful information, for example, out of an uncooperative old Polish lady. So far as possible we avoid families in which all the members cannot speak English.

The second difficulty presented by such families is that substantially all of their kin except the immediate parent-children family group are still in the old country. The immigrant has usually not kept in close touch with the folks at home, and in consequence the genetic aspect of the case suffers badly.

For another reason we take only white patients. The Negro is a good-humored and generally cooperative patient. But in Baltimore, at least, no high degree of reliability can be attached to any of the genetic information which he is so cheerfully willing to give. The Negro is a great rationalizer, when it comes to family relationships.

Visitors who have inspected our clinic often express wonderment at the extent and completeness of the photographic records in our cases. We have experienced little difficulty in getting the consent of the patient to being photographed in the nude. Very occasionally we find a patient who resolutely and permanently refuses to be so photographed. After all our persuasive technique has been exhausted, and it is finally admitted by the workers themselves that they are going to get no photographs, the case is dropped at that point. We have made it a rule from the beginning to put no case into the collection for which there were no photographs of the patient. The reason for this attitude is that we are making, in this work, a detailed biological study of the most complex animal known to the zoologist. No amount of verbal description or measuring, however carefully done, can give anything like so clear an idea of what kind of an individual somatically any particular person was, as can good photographs in three positions, front, back, and side views, of that individual completely nude.

Why we have so little difficulty in getting these photographs is, we think, that we have carefully worked out a psychological technique, planned and studied to accomplish that end. The photographs are taken by the assistant physicians (male or female) with no one else in the room. The time of the taking of the photograph is planned to come *after* the assistant physician has won the confidence and cooperation of the patient through the taking of the history, making of the physical examination, etc. The photography is done in the same room as the examining, and the mechanical technique is so worked out as to entail a minimum of time and annoyance. Finally the workers have mastered a carefully studied line of "patter" or "sales talk" to overcome any hesitation on the patient's part. The proof of the pudding is in the eating. We get the photographs.

Almost the only embarrassment we ever encounter now is the occasional request on the part of the patient for prints for his or her private use. For obvious reasons such requests must be refused. It is our intention, of course, never to publish any of these photographs without masking the face, except where we have explicit written permission to do otherwise. Furthermore, in publishing results, neither names nor initials will be used to designate persons, but instead only numbers.

RECORD FORMS

These are divided, for convenience, into five sets as follows, and each set is printed on paper of a particular color.

I. *Genetic forms*—white paper. Covering family of patient. A 01–04

II. *Patient's record forms*—green paper. Covering patient's history and physical examination. A 1–8

III. *Biometric forms*—brown paper. For biometric measurements. B 1–2

IV. *Home environment form*—yellow paper. For patient's home. C 1

V. *Individual family record forms*—pink paper. For patient's kin. D 1–3.

All the forms are printed on sheets 11 × 8.5 inches, of a good grade of bond paper. A binding margin, one inch wide, is left on the left-hand long side of each sheet.

These forms were initially devised by two of us (R.P. and A.C.S.). They were first used for a year in mimeographed form. Experience pointed out some necessary modification, but in the main the plan has stood the test of time.

Genetic Forms

Form A 01 is a blank sheet, except for indication of name and number of the family and the binding margin. Its primary purpose is to provide space for the genetic chart of the patient's family, for which from one to ten or more such sheets may be necessary. The genetic chart includes all members of the family, with their sex, age (if dead, also the lethal disease when known), and the occurrence among them of the particular disease for which the patient was chosen, or closely related diseases. This sheet is further used for abstracts of hospital and dispensary histories, supplementary notes, autopsy protocols, and the pasting in of photographs and death certificates.

The construction of the genetic chart is a matter of considerable labor and sometimes ingenuity, when the family is large, with several generations, and many productive marriages. There are two cardinal points to be observed. The first is that on the opening pedigree sheet there should appear the patient; his direct ancestors (parents and grandparents); his consort (if married) and previous marriages, if any, of the consort, with progeny from such marriages; the consort's direct ancestors; and the patient's descendants (children and grandchildren). The second requirement is that the remaining members of the family—uncles, aunts, sibs, cousins, with their consorts and the patient's consort's collateral branches—must appear on succeeding sheets. On all sheets each individual should appear in his generation in proper birth order, i.e., in orderly sequence of date of birth.

Individuals in the family are indicated on the genetic chart as males or females by the usual sex signs[4] ♂ and ♀, when the sex is known, otherwise by a circle only. If the individual in the pedigree is known to be dead, the circle of the sex sign is fully inked. Miscarriages are indicated by small black dots, and stillbirths by black circles somewhat smaller than those of the signs for living born individuals. The names of the persons are written in opposite the sex signs. Beside the name (if known) of each living born individual is entered the present age, or the age at death, if dead. When the cause of death of a person is known, this is set down under his name. For sex signs, the names and ages of persons, for causes of death and for indicating stillbirths, miscarriages and abortions, black ink is used. If the person is living, such pertinent information as blood pressure, the existence of some particular affection under study, such as hypertension, apoplexy, angina, etc., or of some other affection, such as cancer, syphilis, haemophilia, Friedreich's ataxia, which characterizes the family, may be inserted below the name. All this information is put in with red ink.

When the chart is completed, individual members of the family are numbered in red ink, in series, by generations, beginning with the first person appearing in the first (oldest) generation recorded (at the left side of the first sheet of the chart) and ending with the

[4] We prefer these signs, established by long tradition and usage in the biological sciences to the squares and circles now so fashionable in American eugenic writings. Why these horrid and intrinsically meaningless latter day symbols ever came into use we do not know, but probably it was because some eugenic uplifter was shocked by the phallic symbolism of the old traditional sex signs.

last person recorded in the ultimate generation, whether or not this person appears on the first or any other genetic sheet.

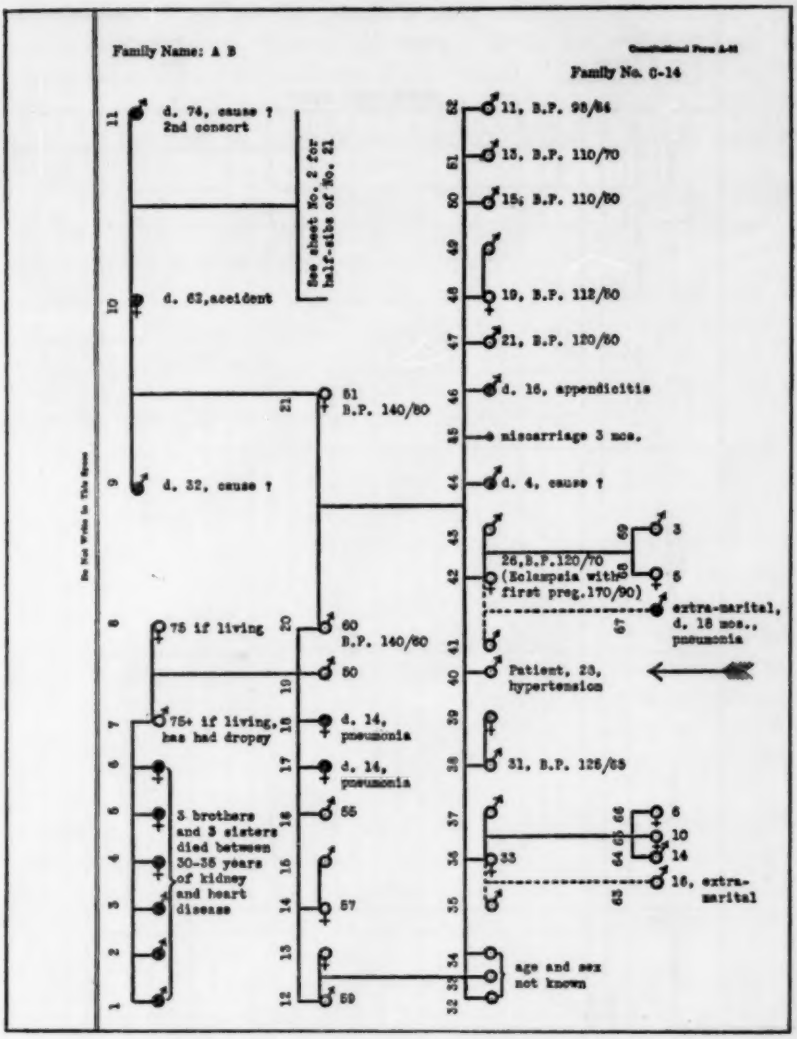


FIG. 2. SAMPLE GENETIC CHART. FORM A 01

The appearance of an actual completed genetic sheet is shown in Fig. 2.

Form A 02. Upon this sheet (shown in facsimile in Fig. 3) are recorded in proper birth order the names and the dates of birth,

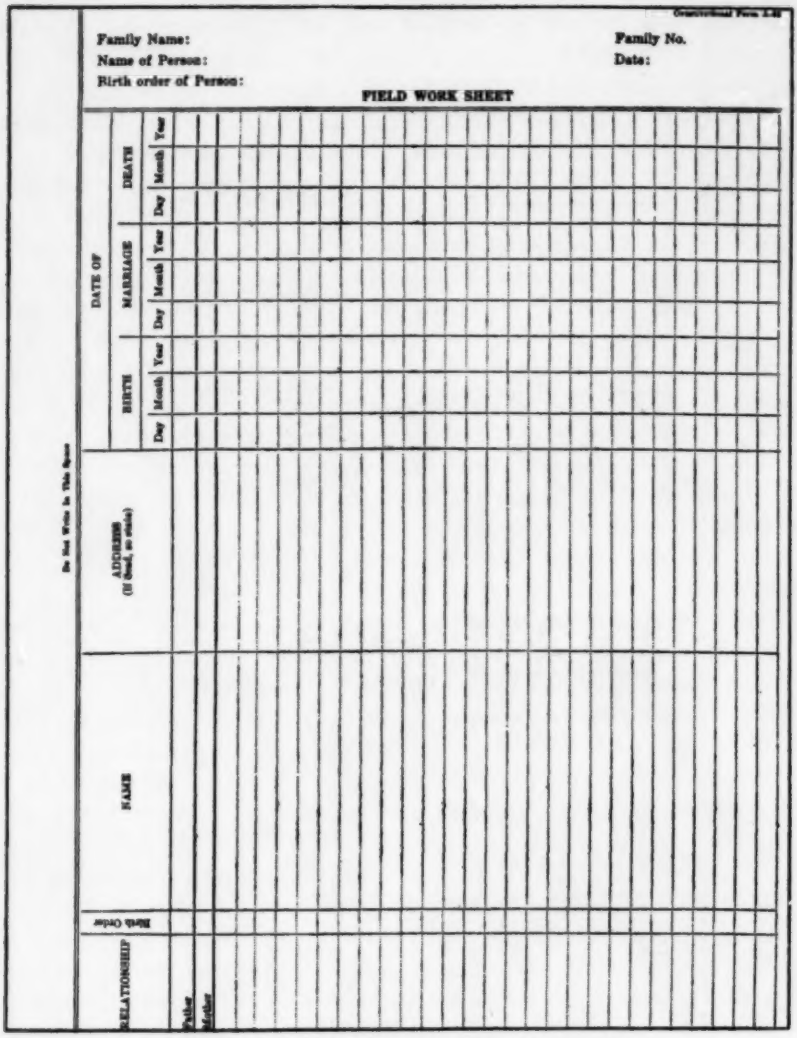


FIG. 3. FORM A 02, IN REDUCED FACSIMILE

marriage, and death (if these latter events have occurred) of the patient, the patient's father, mother, sibs, and children.

In case of marriage of sibs and children of the patient, the same data are entered in order for their consorts and children, and for the consorts and children of these and their descendants (if any), all in such manner that the consorts and the issue of marriages (also extra-marital issue) appear in correct birth order. Divorces and remarriages (and the products of the latter) of all blood relatives and connections of the patient (consorts of *patient's blood relatives*) are carefully recorded in order of their occurrence, with names, ages, and dates.

Stillbirths (with sex if known), miscarriages and abortions (whether or not induced) with the month of gestation are entered under each marriage (or mother if extra-marital).

Causes of death and age at death are carefully inquired into and recorded. When copies of death certificates, abstracts of autopsy or of biopsy protocols are obtained, as is often the case, the fact that they will be found further on in the history is indicated in red ink opposite names of the persons to whom they relate.

This Form A 02 with suitable changes in headings, is used for recording the patient's grandparents, uncles, aunts, cousins, etc., and their marriages, when data on them can be got. When more than one sheet is used the sheets are arranged and numbered in proper order.

Form A 03. This sheet, shown in Fig. 4, is used for the *consort* (if the patient is or has been married) *and his or her family*, and the data obtained are entered in the same manner and with the same detail as those for the patient's family. If the patient has had more than one consort, or if the consort or consorts have been previously married, with or without issue, pertinent information in regard to these events is entered. As in case of Form A 02, as many sheets of Form A 03 as may be necessary are used.

Forms A 02 *and A* 03 are filled out by the examining physician from information derived from the patient in one or more interviews. Supplementary data, in many instances much more complete and accurate, are later obtained by the field worker, who has the advantage of interviewing many members of the family.

Form A 04. This racial code sheet, shown in Fig. 5, on which the main racial groups found in the American population are given code numbers, is filed with each family history. The patient's racial origin is checked opposite the proper number on the sheet. In cases of mixed origin, where the father comes from one racial group and the mother from another, this circumstance is suitably indicated. For

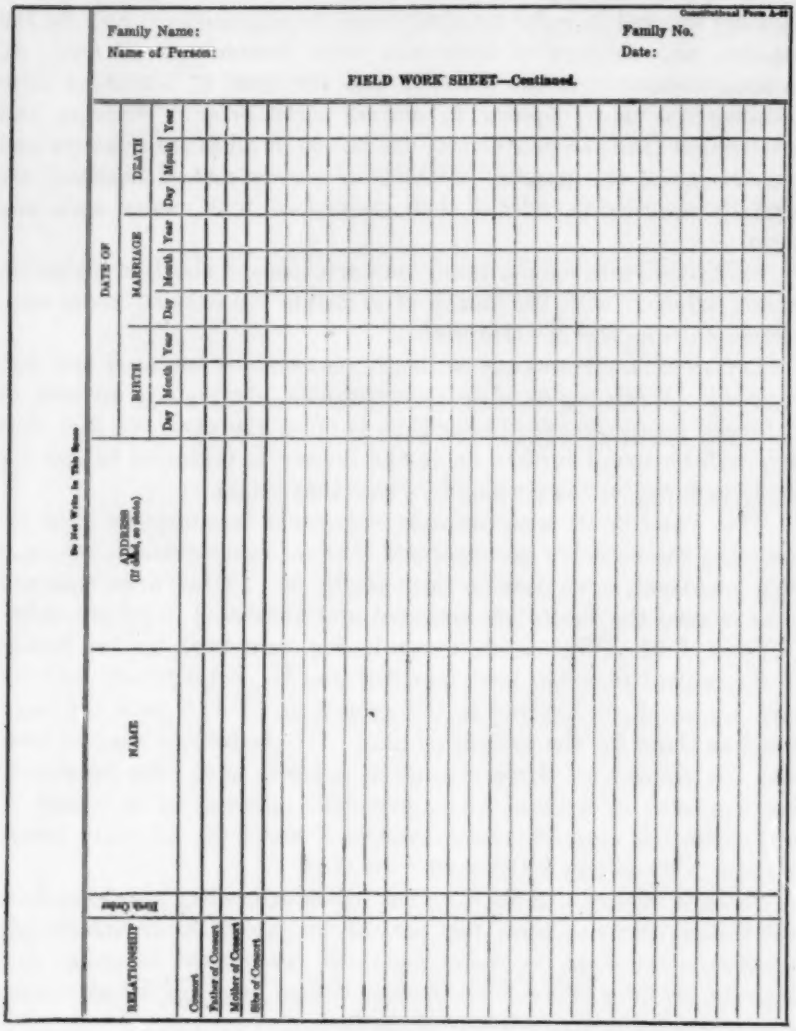
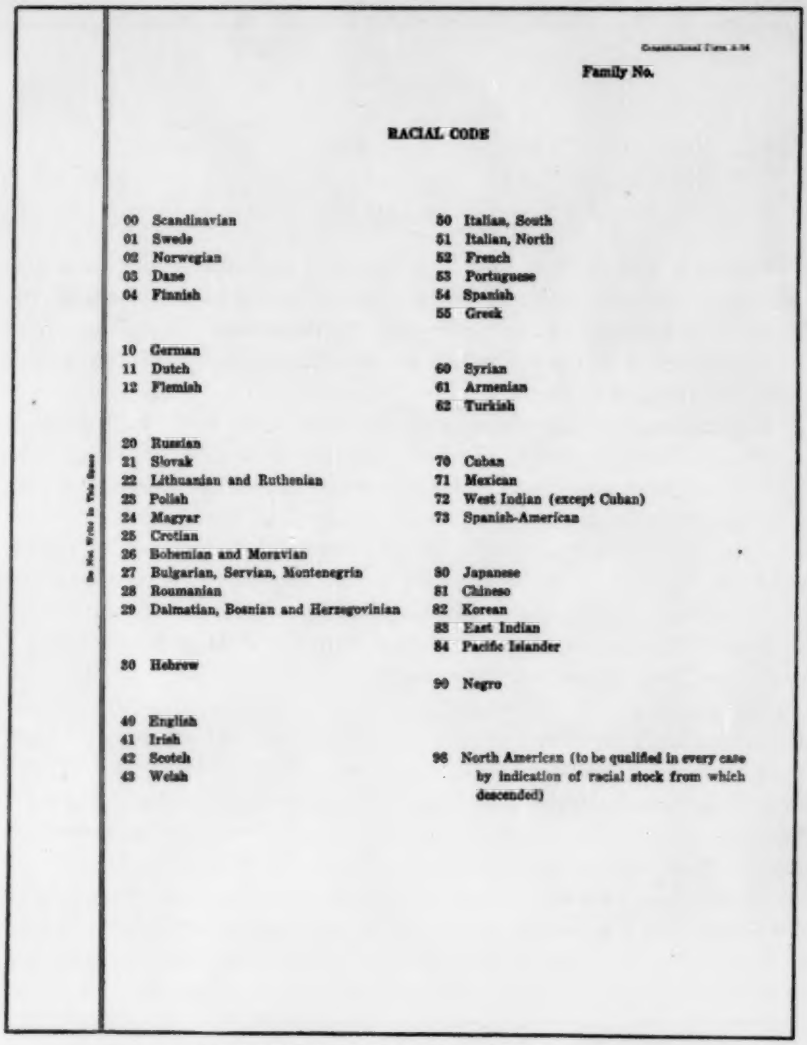


FIG. 4. FORM A 03 IN REDUCED FACSIMILE



Do Not Write In This Space

Family No.

RACIAL CODE

00	Scandinavian	50	Italian, South
01	Swede	51	Italian, North
02	Norwegian	52	French
03	Dane	53	Portuguese
04	Finnish	54	Spanish
		55	Greek
10	German		
11	Dutch	60	Syrian
12	Flemish	61	Armenian
		62	Turkish
20	Russian		
21	Slovak	70	Cuban
22	Lithuanian and Ruthenian	71	Mexican
23	Polish	72	West Indian (except Cuban)
24	Magyar	73	Spanish-American
25	Crotian		
26	Bohemian and Moravian		
27	Bulgarian, Servian, Montenegrin	80	Japanese
28	Roumanian	81	Chinese
29	Dalmatian, Bosnian and Herzegovinian	82	Korean
		83	East Indian
		84	Pacific Islander
30	Hebrew		
		90	Negro
40	English		
41	Irish		
42	Scotch	98	North American (to be qualified in every case by indication of racial stock from which descended)
43	Welsh		

FIG. 5. FORM A 04 IN REDUCED FACSIMILE

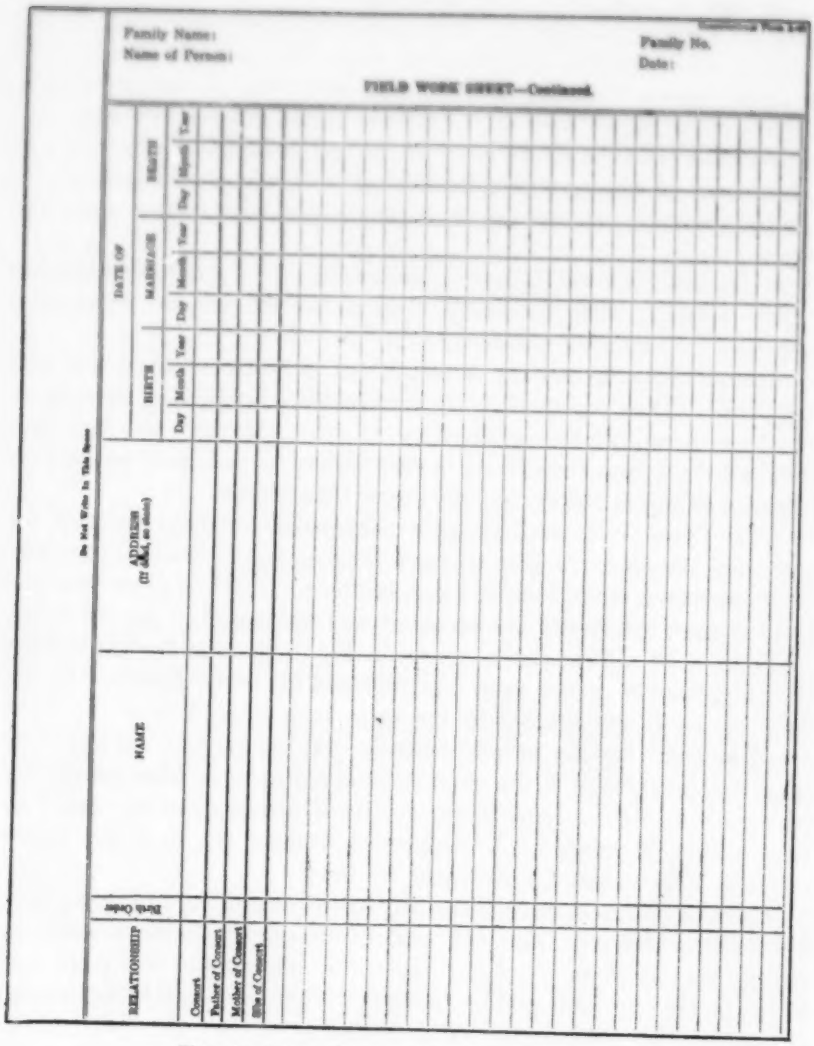


FIG. 4. FORM A 03 IN REDUCED FACSIMILE

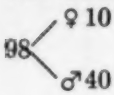
Family No.

RACIAL CODE

00	Scandinavian	50	Italian, South
01	Swede	51	Italian, North
02	Norwegian	52	French
03	Dane	53	Portuguese
04	Finnish	54	Spanish
		55	Greek
10	German		
11	Dutch	60	Syrian
12	Flemish	61	Armenian
		62	Turkish
20	Russian		
21	Slovak	70	Cuban
22	Lithuanian and Ruthenian	71	Mexican
23	Polish	72	West Indian (except Cuban)
24	Magyar	73	Spanish-American
25	Crotian		
26	Bohemian and Moravian		
27	Bulgarian, Servian, Montenegrin	80	Japanese
28	Roumanian	81	Chinese
29	Dalmatian, Bosnian and Herzegovinian	82	Korean
		83	East Indian
		84	Pacific Islander
30	Hebrew		
		90	Negro
40	English		
41	Irish		
42	Scotch	98	North American (to be qualified in every case by indication of racial stock from which descended)
43	Welsh		

FIG. 5. FORM A 04 IN REDUCED FACSIMILE

instance if a patient with an English father and a German mother was born in the United States the racial stock is thus expressed.



Patient's Record Forms

History

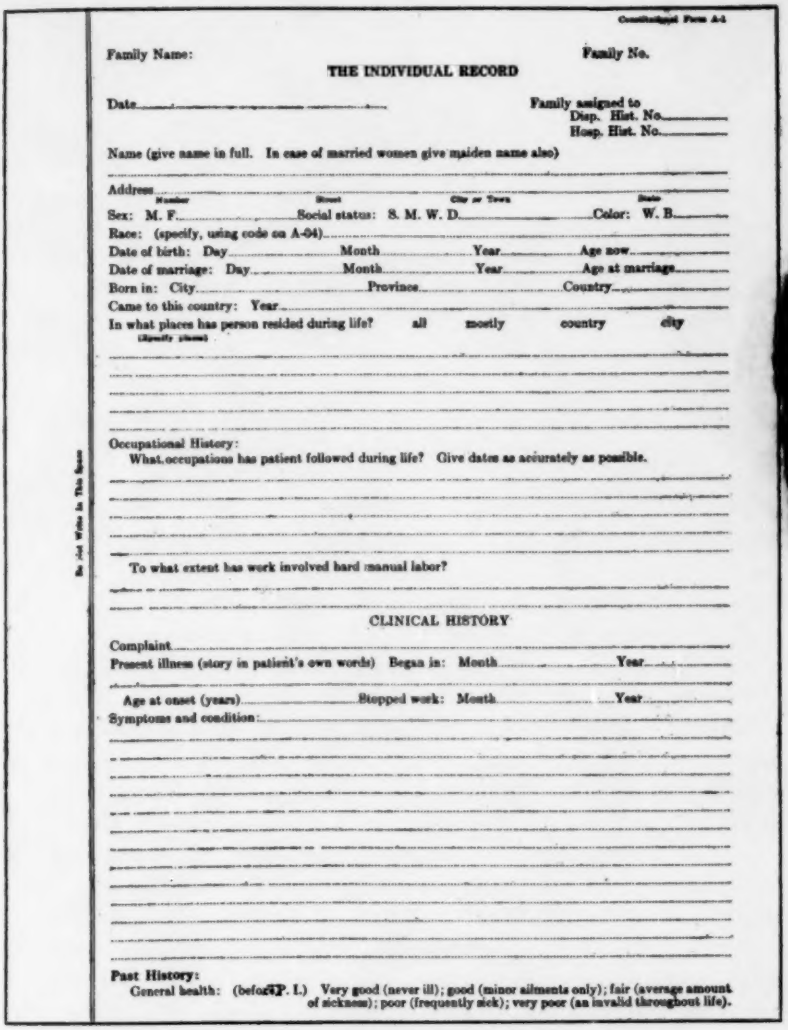
Forms A 1–8, B 1–2, and C 1 are used exclusively for data pertaining to the patient (and when possible to other members of the family who consent to have complete examinations made), and with the exception of C 1 are filled in by the examining physician, who is especially trained in the technique.

In planning this investigation it was constantly borne in mind that the data collected should comply with the following criteria. The questions asked must be (1) strictly relevant to the purpose of the investigation; (2) inclusive, i.e., must apply to all individuals, allowing for differences of sex and age; (3) systematic, i.e., grouped in logical order; (4) specific, i.e., definite and unambiguous; (5) comprehensive, i.e., covering the fields the investigators were capable of exploring; (6) objective, i.e., avoiding individual bias as far as possible; and (7) conveniently arranged for recording and analyzing.

The forms set up for recording the data cover completely, subject to the implications of criterion 5, all fields of general medicine. They do not include such specialities as psychiatry, obstetrics, and genito-urinary diseases of males and females, because these and certain other branches of medicine are at present outside the scope of our investigations; but for them supplementary forms along similar lines could readily be constructed, and in certain cases, notably in the study of Friedreich's ataxia, we have made such supplementary record forms.

Forms A 1–4, shown in Figs. 6–9 inclusive, deal with the essential facts of the *patient's personal and medical history*, as obtained by direct questions asked by the physician. The questions are simple and direct, but comprehensive withal, and are restricted to circumstances, events, bodily functions and variations, symptoms and diseases, concerning which a person of ordinary intelligence can usually give reliable answers, or, if the patient is a child, which the mother can answer. They differ little from those covered in the history taken in a properly conducted office consultation. The only important dis-

tinction lies in the fact that in this work *all the data are recorded for every patient.* We permit no blank spaces or missing records.



Constitutional Form A-1

Family Name: Family No.

THE INDIVIDUAL RECORD

Date Family assigned to
Disp. Hist. No.
Hosp. Hist. No.

Name (give name in full. In case of married women give maiden name also)

Address
Number Street City or Town State

Sex: M. F. Social status: S. M. W. D. Color: W. B.

Race: (specify, using code on A-04)

Date of birth: Day Month Year Age now

Date of marriage: Day Month Year Age at marriage

Born in: City Province Country

Came to this country: Year

In what places has person resided during life? all mostly country city
(Specify places)

Occupational History:

What occupations has patient followed during life? Give dates as accurately as possible.

To what extent has work involved hard manual labor?

CLINICAL HISTORY

Complaint

Present illness (story in patient's own words) Began in: Month Year

Age at onset (years) Stopped work: Month Year

Symptoms and condition:

Past History:

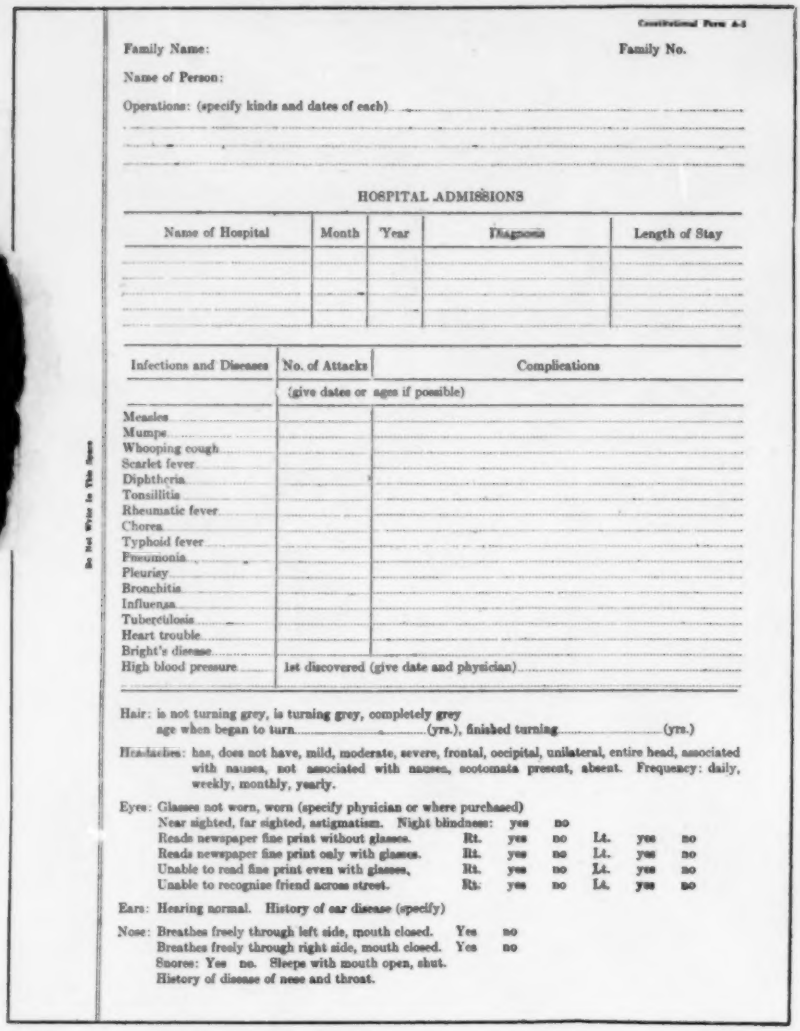
General health: (before P. I.) Very good (never ill); good (minor ailments only); fair (average amount of sickness); poor (frequently sick); very poor (an invalid throughout life).

Do Not Write In This Space

FIG. 6. FORM A 1 IN REDUCED FACSIMILE

Taking up the forms in order, it will be noted that in *Form A* 1, stress is laid first on the general conditions of the patient's life, as

regards urban or rural residence, the kind of work done and its demands on energy output, and second on his present illness. If the patient



Constitutional Form A-2

Family Name: Family No.

Name of Person:

Operations: (specify kinds and dates of each)

HOSPITAL ADMISSIONS

Name of Hospital	Month	Year	Diagnosis	Length of Stay

Infections and Diseases	No. of Attacks (give dates or ages if possible)	Complications
Measles		
Mumps		
Whooping cough		
Scarlet fever		
Diphtheria		
Tonsillitis		
Rheumatic fever		
Chorea		
Typhoid fever		
Pneumonia		
Pleurisy		
Bronchitis		
Influenza		
Tuberculosis		
Heart trouble		
Bright's disease		
High blood pressure	1st discovered (give date and physician)	

Do Not Write in This Space

Hair: is not turning grey, is turning grey, completely grey
age when began to turn (yrs.), finished turning (yrs.)

Headaches: has, does not have, mild, moderate, severe, frontal, occipital, unilateral, entire head, associated with nausea, not associated with nausea, scotomata present, absent. Frequency: daily, weekly, monthly, yearly.

Eyes: Glasses not worn, worn (specify physician or where purchased)
Near sighted, far sighted, astigmatism. Night blindness: yes no
Reads newspaper fine print without glasses. Rt. yes no Lt. yes no
Reads newspaper fine print only with glasses. Rt. yes no Lt. yes no
Unable to read fine print even with glasses. Rt. yes no Lt. yes no
Unable to recognise friend across street. Rt. yes no Lt. yes no

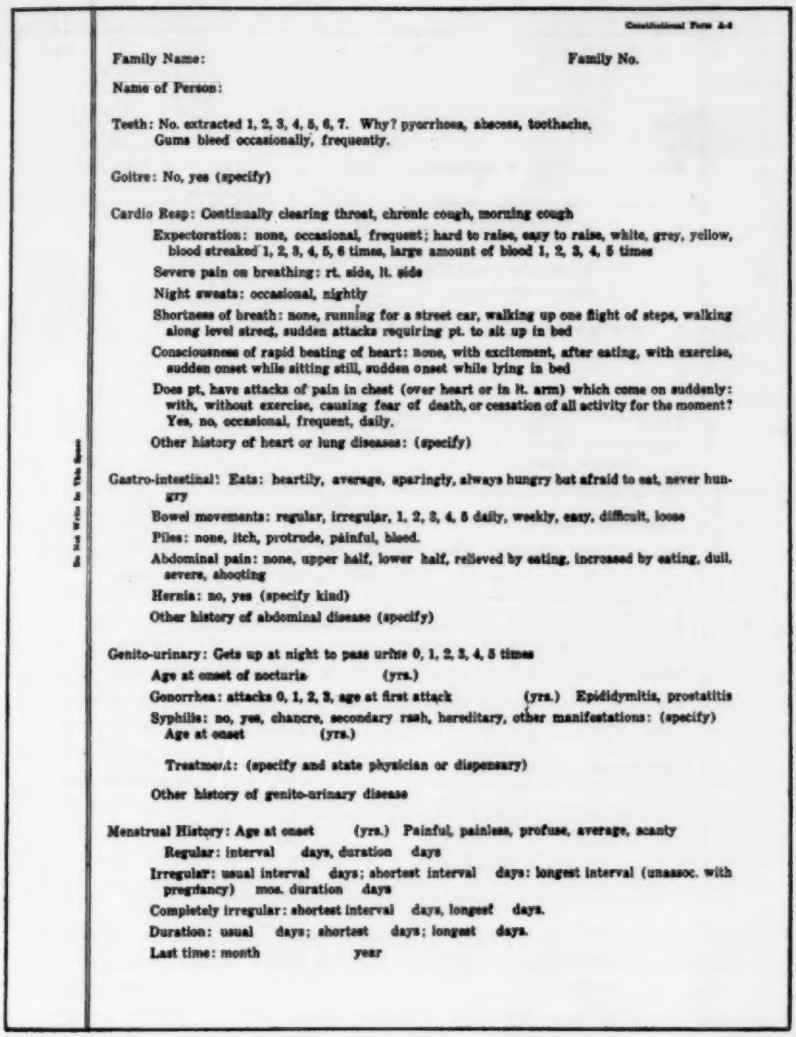
Ears: Hearing normal. History of ear disease (specify)

Nose: Breathes freely through left side, mouth closed. Yes no
Breathes freely through right side, mouth closed. Yes no
Snores: Yes no. Sleeps with mouth open, shut.
History of disease of nose and throat.

FIG. 7. FORM A 2 IN REDUCED FACSIMILE

has ever been treated before in the dispensary or hospital full abstracts are made on Form A 01 of the symptoms, objective findings, diagnosis,

operations, etc., if any, as recorded in these histories, and these are filed with the examination forms. In many cases there are elaborate



Constitutional Form A-4

Family Name: Family No.

Name of Person:

Teeth: No. extracted 1, 2, 3, 4, 5, 6, 7. Why? pyorrhoea, abscess, toothache, Gums bleed occasionally, frequently.

Goitre: No, yes (specify)

Cardio Resp: Continually clearing throat, chronic cough, morning cough

Expectoration: none, occasional, frequent; hard to raise, easy to raise, white, grey, yellow, blood streaked 1, 2, 3, 4, 5, 6 times, large amount of blood 1, 2, 3, 4, 5 times

Severe pain on breathing: rt. side, lt. side

Night sweats: occasional, nightly

Shortness of breath: none, running for a street car, walking up one flight of steps, walking along level street, sudden attacks requiring pt. to sit up in bed

Consciousness of rapid beating of heart: none, with excitement, after eating, with exercise, sudden onset while sitting still, sudden onset while lying in bed

Does pt. have attacks of pain in chest (over heart or in lt. arm) which come on suddenly: with, without exercise, causing fear of death, or cessation of all activity for the moment? Yes, no, occasional, frequent, daily.

Other history of heart or lung diseases: (specify)

Do Not Write In This Space

Gastro-intestinal: Eats: heartily, average, sparingly, always hungry but afraid to eat, never hungry

Bowel movements: regular, irregular, 1, 2, 3, 4, 5 daily, weekly, easy, difficult, loose

Piles: none, itch, protrude, painful, bleed.

Abdominal pain: none, upper half, lower half, relieved by eating, increased by eating, dull, severe, shooting

Hernia: no, yes (specify kind)

Other history of abdominal disease (specify)

Genito-urinary: Gets up at night to pass urine 0, 1, 2, 3, 4, 5 times

Age at onset of nocturia (yrs.)

Gonorrhea: attacks 0, 1, 2, 3, age at first attack (yrs.) Epididymitis, prostatitis

Syphilis: no, yes, chancre, secondary rash, hereditary, other manifestations: (specify)
Age at onset (yrs.)

Treatment: (specify and state physician or dispensary)

Other history of genito-urinary disease

Menstrual History: Age at onset (yrs.) Painful, painless, profuse, average, scanty

Regular: interval days, duration days

Irregular: usual interval days; shortest interval days: longest interval (unassoc. with pregnancy) mos. duration days

Completely irregular: shortest interval days, longest days.

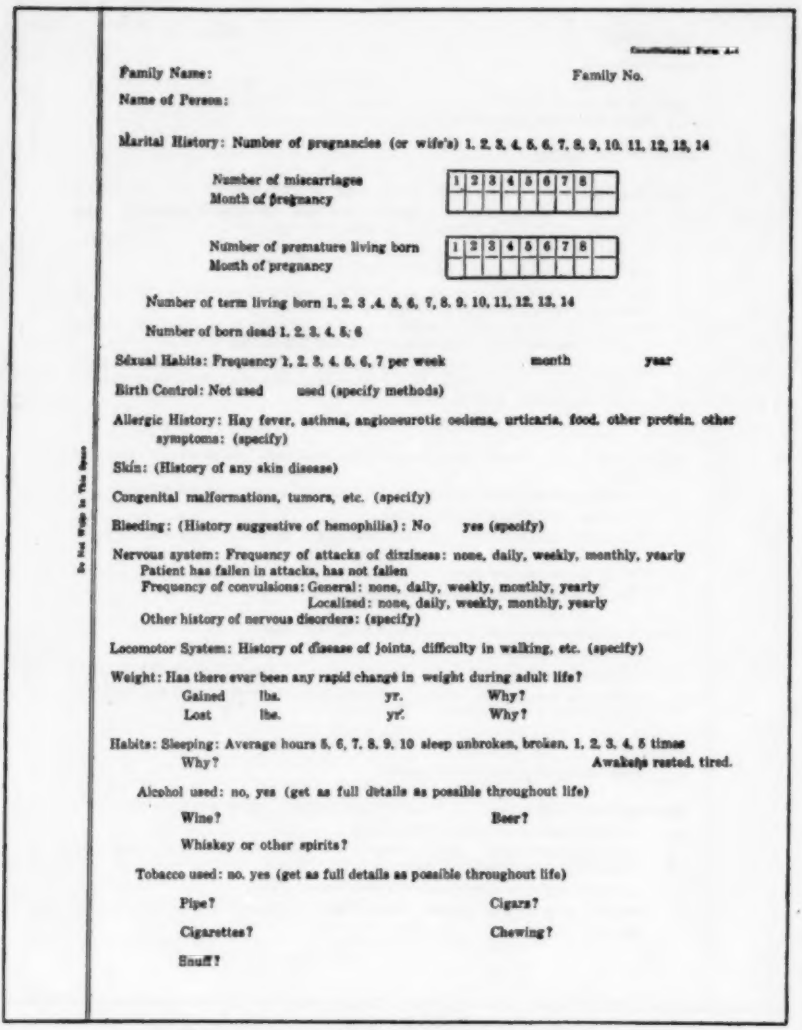
Duration: usual days; shortest days; longest days.

Last time: month year

FIG. 8. FORM A 3 IN REDUCED FACSIMILE

histories, involving several departments and extending over many years.

Religious affiliation or association is included among the interrogatories because of its bearing upon the general and personal *mores* of the individual.



Family Name: Family No.

Name of Person:

Marital History: Number of pregnancies (or wife's) 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14

Number of miscarriages
Month of pregnancy | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Number of premature living born
Month of pregnancy | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Number of term living born 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14

Number of born dead 1. 2. 3. 4. 5. 6

Sexual Habits: Frequency 1. 2. 3. 4. 5. 6. 7 per week month year

Birth Control: Not used used (specify methods)

Allergic History: Hay fever, asthma, angioneurotic oedema, urticaria, food, other protein, other symptoms: (specify)

Skin: (History of any skin disease)

Congenital malformations, tumors, etc. (specify)

Bleeding: (History suggestive of hemophilia): No yes (specify)

Nervous system: Frequency of attacks of dizziness: none, daily, weekly, monthly, yearly
Patient has fallen in attacks, has not fallen
Frequency of convulsions: General: none, daily, weekly, monthly, yearly
Localized: none, daily, weekly, monthly, yearly
Other history of nervous disorders: (specify)

Locomotor System: History of disease of joints, difficulty in walking, etc. (specify)

Weight: Has there ever been any rapid change in weight during adult life?
Gained lbs. yr. Why?
Lost lbs. yr. Why?

Habits: Sleeping: Average hours 5. 6. 7. 8. 9. 10 sleep unbroken, broken. 1. 2. 3. 4. 5 times
Why? Awakens rested, tired.

Alcohol used: no, yes (get as full details as possible throughout life)

Wine? Beer?

Whiskey or other spirits?

Tobacco used: no, yes (get as full details as possible throughout life)

Pipe? Cigars?

Cigarettes? Chewing?

Snuff?

FIG. 9. FORM A 4 IN REDUCED FACSIMILE

Form A 2 covers the history of surgical operations, hospital admissions, the occurrence of various common infections, and some

important chronic organic diseases. Gonorrhoea and syphilis, which evidently deserve greater detail, are taken up under the genito-urinary system, on *Form A* 3.

The remainder of *Form A* 2 and *Forms A* 3 and 4 are devoted to the head (including the hair, headaches, vision, hearing, the nose, the teeth, the thyroid), the cardio-respiratory, the gastro-intestinal, and the genito-urinary systems, and to the menstrual history.

On *Form A* 4 one third of the space is devoted to the important and usually neglected subject of sexual history. In addition to the total number of pregnancies, provision is made for the recording of not only the number of living and dead born full term children, but the number of miscarriages (including abortions) and of premature living born, with the periods of gestation by months.

The frequency of sexual intercourse, by week, month or year (by five or ten year periods of life when possible), and the use or non-use of what were, or were believed to be, contraceptive methods (including induced abortions) are set down under these headings with as much detail as it is possible to obtain.

In training our clinicians and field workers the following memorandum is used, relative to the questions regarding the reproductive history:

> Further knowledge concerning the correlation between frequency of intercourse and frequency of conception is urgently needed. Birth control, conscious and designed, is affected by (a) abstinence in varying degree, or (b) contraceptive measures of various sorts. To these must be added, in the world as it actually exists, the causing of the expulsion of fertilized ova, or induced abortion. The nullifying effects of these measures upon the consequences of frequent sexual intercourse is obvious.
>
> Various diseases, such as syphilis, pneumonia, influenza, malaria, variola, by killing or causing the expulsion of fertilized ova, cut down the proportion of live births per marriage. Of these the most important is thought to be syphilis. However, the connection between the others—particularly pneumonia and influenza—and abortions and miscarriages is to be inquired into carefully in each case.
>
> The above considerations are sufficient to indicate the importance of careful and painstaking efforts to obtain full information on these two questions of sexual habits and birth control.
>
> In regard to the first of these, detailed information concerning the actual frequency of sexual intercourse during the individual's entire sexual life is desired. To record once or twice per month for a man or a woman aged 45, 50 or 60 years, while possibly or even probably correct for these particular ages, fails by far to give the true history of this physiological activity in this person. The other ages are of equal or of even greater importance.

It is suggested that in the case of married women the investigator start with the present time and then trace back by 10 year periods in even decades (i.e. 20–29, 30–39, etc.) to the beginning of married life. In the case of widows the questioning should begin with the period immediately previous to the husband's death. Multiple marriages are to be treated, of course, on the same plan as outlined above. In the case of unmarried women who acknowledge having been pregnant, begin with the particular set of sexual activities leading to the first impregnation, and follow the lead backwards and forwards from that.

The natural sequence for these questions (in the case of women) is that of the history sheets—i.e., after the information regarding pregnancies. In some cases the investigator may judge that it is best to postpone this part of the history until after the patient's confidence has been gained more securely.

The question of birth control is best approached indirectly and without the use of this term. For instance, a woman of 35, married 15 years, childless or with one or two pregnancies only, should be asked first to what she attributes her failure to have more children, and the question of preventive measures will follow naturally. Similarly a woman of many pregnancies may be asked very naturally if she had never been advised or tempted to try preventive measures to avoid such frequent conceptions.

Frequent abortions or miscarriages, particularly in the absence of some disease of the generative organs, or of those previously mentioned, are suggestive of contraception, and the woman should be questioned carefully concerning them, especially as to whether any of them followed taking medicine or the use of mechanical measures.

Failure to conceive is frequently, though by no means always, associated with gonorrhoea, puerperal salpingitis, uterine displacements, etc.

Men are to be questioned with the same tact, but with a somewhat wider latitude, especially in regard to premarital intercourse and extramarital intercourse; also in regard to impotence.

Checking the results of man and wife independently is of great importance.

When contraceptive measures are acknowledged to have been used, find out exactly and record what they were, and the patient's opinion of their effectiveness. This applies, of course, to persons of both sexes. It is probable that with women the questions of frequency of sexual intercourse and birth control will be approached best in connection with the number of pregnancies, or with failure to conceive, as the case may be.

It is important here, as throughout the examination, to impress the patient with the idea that these questions have a bearing upon his or her particular illness.

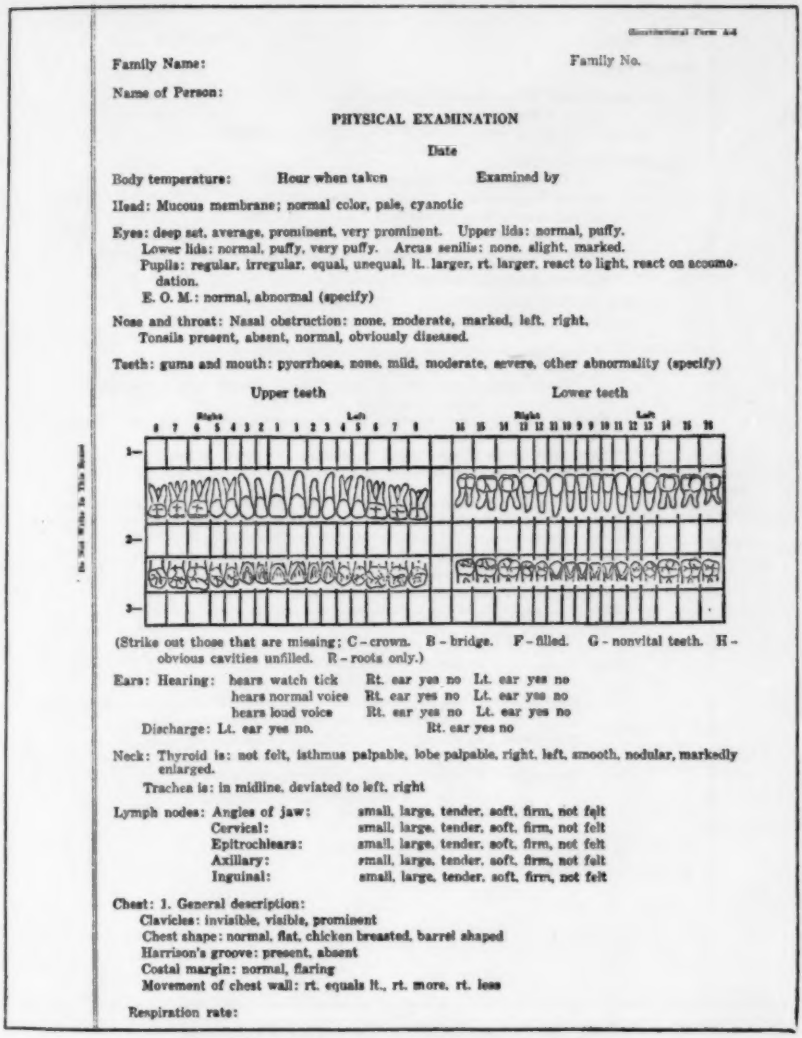
Inquiry into the state and functioning of the bodily organs concludes with affections of the skin, the nervous, and the locomotor systems.

Anomalies are covered under the headings allergic history, congenital malformations, tumors, and bleeding.

This anamnesis concludes with detailed information regarding gain and loss of weight, duration and quality of sleep, and the use of tobacco and alcohol.

Physical Examination

The physical examination of the patient covers the systematic inquiry into the normal and pathological anatomy of most of the



Constitutional Form A-5

Family Name: Family No.

Name of Person:

PHYSICAL EXAMINATION

Date

Body temperature: Hour when taken Examined by

Head: Mucous membrane; normal color, pale, cyanotic

Eyes: deep set, average, prominent, very prominent. Upper lids: normal, puffy.
Lower lids: normal, puffy, very puffy. Arcus senilis: none, slight, marked.
Pupils: regular, irregular, equal, unequal, lt. larger, rt. larger, react to light, react on accomodation.
E. O. M.: normal, abnormal (specify)

Nose and throat: Nasal obstruction: none, moderate, marked, left, right,
Tonsils present, absent, normal, obviously diseased.

Teeth: gums and mouth: pyorrhoea, none, mild, moderate, severe, other abnormality (specify)

Upper teeth Lower teeth

Right Left Right Left

8 7 6 5 4 3 2 1 1 2 3 4 5 6 7 8 16 15 14 13 12 11 10 9 9 10 11 12 13 14 15 16

1— 2— 3—

(Strike out those that are missing; C - crown. B - bridge. F - filled. G - nonvital teeth. H - obvious cavities unfilled. R - roots only.)

Ears: Hearing: hears watch tick Rt. ear yes no Lt. ear yes no
hears normal voice Rt. ear yes no Lt. ear yes no
hears loud voice Rt. ear yes no Lt. ear yes no
Discharge: Lt. ear yes no. Rt. ear yes no

Neck: Thyroid is: not felt, isthmus palpable, lobe palpable, right, left, smooth, nodular, markedly enlarged.
Trachea is: in midline, deviated to left, right

Lymph nodes: Angles of jaw: small, large, tender, soft, firm, not felt
Cervical: small, large, tender, soft, firm, not felt
Epitrochlears: small, large, tender, soft, firm, not felt
Axillary: small, large, tender, soft, firm, not felt
Inguinal: small, large, tender, soft, firm, not felt

Chest: 1. General description:
Clavicles: invisible, visible, prominent
Chest shape: normal, flat, chicken breasted, barrel shaped
Harrison's groove: present, absent
Costal margin: normal, flaring
Movement of chest wall: rt. equals lt., rt. more, rt. less

Respiration rate:

Do Not Write In This Space

FIG. 10. FORM A 5 IN REDUCED FACSIMILE

organs and other structures (the larynx and the genito-urinary organs excepted) which are readily susceptible to examination in a medical

clinic by inspection, palpation, percussion, and auscultation, with the aid, where necessary, of such relatively simple instruments of pre-

Constitutional Form A-6

Family Name: Family No.

Name of Person:

2. Lungs: Distance of lung bases at rest below 7th cerv. spine cm.
if not at equal levels rt. cm., lt. cm.
Condition of lungs on exam.: normal, abnormal (specify pathology)

3. Heart Dorsal, upright
P. M. I., seen, not seen; localized, diffuse, weak, forceful
Distance from midline cm., interspace 4, 5, 6, 7;
Distance from suprasternal notch cm.
Cardiac dullness: cm. to left M. S. L.; cm. to right M. S. L.
Heart rhythm: regular, presystolic gallop, protodiastolic gallop, extrasystolic, fibrillating
Murmurs: none, yes (specify)

4. Pulse: Dorsal, upright. Rate Blood pressure: S. D.
Rhythm: regular, extrasystole, none, occasional, frequent, completely irregular

Arteries: Temporal: Vessel wall seen, not seen, tortuous, very tortuous
Radial: Rt. pulse equals lt., rt. larger, rt. smaller.
Vessel walls: not felt, felt, soft, hard, diffuse thickening, nodular, straight, tortuous, very tortuous
Brachial: vessel walls (*elbow straight*): not seen, seen, not felt, felt, soft, hard, diffuse thickening, nodular, straight, tortuous, very tortuous.
Posterior tibial: Pulse present, absent, rt. equals lt., rt. larger, rt. smaller
Dorsalis pedis: Pulse present, absent, rt. equals lt., rt. larger, rt. smaller

Abdomen: Abdominal walls: fatty layer: thin, medium, thick. Muscle wall: relaxed, not relaxed, flabby, firm: Muscle spasm localized in U. R. Q., U. L. Q., L. R. Q., L. L. Q.
Liver: not felt, felt cm. below costal margin, smooth, not smooth
Spleen: not felt, felt cm. below costal margin, smooth, not smooth
Kidney rt.: not felt, felt, normal size, enlarged, tender
Kidney lt.: not felt, felt, normal size, enlarged, tender
Hernia: no, yes, rt., lt., direct, indirect, inguinal, umbilical, femoral
Additional Note:

Reflexes: Biceps: Rt. absent, average, diminished, exaggerated.
Lt. absent, average, diminished, exaggerated.
Knee Kick: Rt. absent, average, diminished, exaggerated.
Lt. absent, average, diminished, exaggerated.
Ankle Jerk: Rt. absent, average, diminished, exaggerated.
Lt. absent, average, diminished, exaggerated.
Abdominal: Rt. absent, average, diminished, exaggerated.
Lt. absent, average, diminished, exaggerated.
Romberg: Absent, slight, marked.

Extremities: Tremor of extended fingers: none, fine, coarse. Additional note:

Malformations: (specify)

Fig. 11. Form A 6 in Reduced Facsimile

cision as the thermometer, the watch, the reflex hammer, the stethoscope, the sphygmomanometer, and the ophthalmoscope.

It will be noted on *Forms A 5 and A 6* that, in respect of the scope and order of subject matter, this examination follows closely the clinical history recorded on Forms A 1–4.

Constitutional Form A-7

Family Name: Family No.

Name of Person:

LABORATORY STUDIES

Urine Examination

Date	Appearance	Reaction	Sp. gr.	Alb.	Sugar	Microscopic

Kidney function (phenolsulfonephthalein eliminated)

Date	During first hour		During second hour		Total	
	Amount	Per cent	Amount	Per cent	Amount	Per cent

Do Not Write in This Space

Wasserman Reaction on Blood Serum

Date	Result

Spinal Fluid Examination

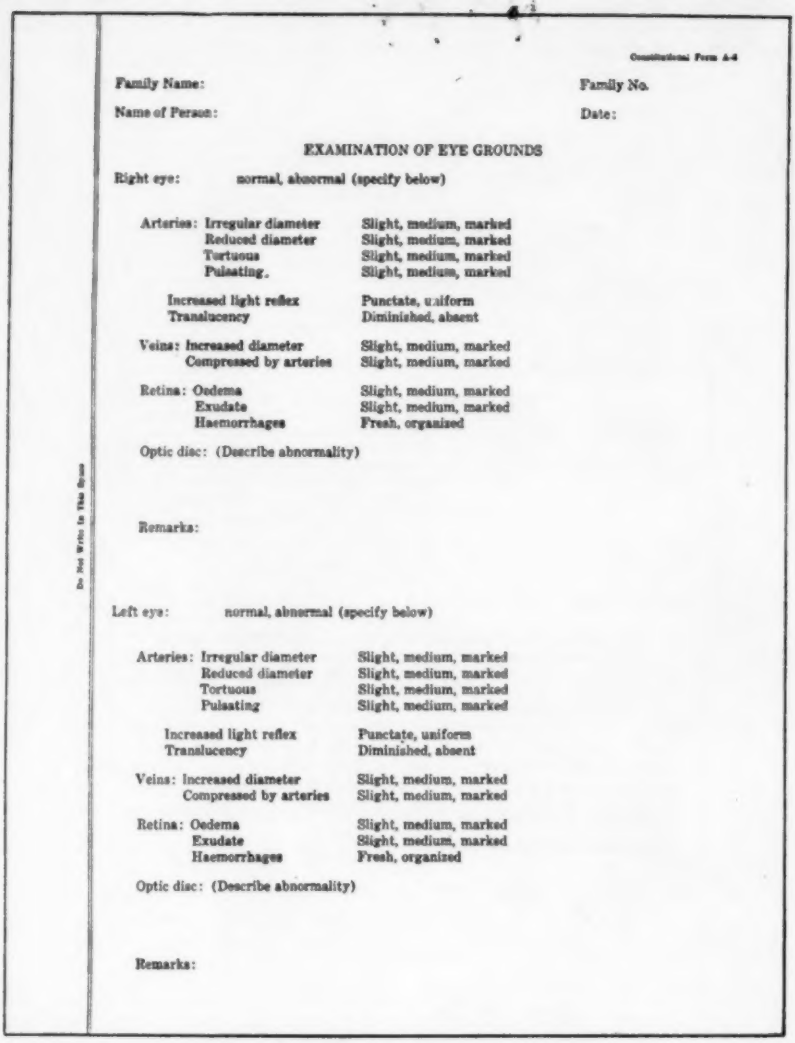
Date	Result

Basal metabolism: (give date and result)

FIG. 12. FORM A 7, IN REDUCED FACSIMILE

The relatively considerable space and detail devoted to the heart and the arteries are demanded both by the comparative importance

of these organs and by the facility with which their anatomy and physiology may be investigated by simple means. Results of labora-



Constitutional Form A-4

Family Name: Family No.

Name of Person: Date:

EXAMINATION OF EYE GROUNDS

Right eye: normal, abnormal (specify below)

Arteries:	Irregular diameter	Slight, medium, marked
	Reduced diameter	Slight, medium, marked
	Tortuous	Slight, medium, marked
	Pulsating.	Slight, medium, marked
	Increased light reflex	Punctate, uniform
	Translucency	Diminished, absent
Veins:	Increased diameter	Slight, medium, marked
	Compressed by arteries	Slight, medium, marked
Retina:	Oedema	Slight, medium, marked
	Exudate	Slight, medium, marked
	Haemorrhages	Fresh, organized

Optic disc: (Describe abnormality)

Remarks:

Do Not Write in This Space

Left eye: normal, abnormal (specify below)

Arteries:	Irregular diameter	Slight, medium, marked
	Reduced diameter	Slight, medium, marked
	Tortuous	Slight, medium, marked
	Pulsating	Slight, medium, marked
	Increased light reflex	Punctate, uniform
	Translucency	Diminished, absent
Veins:	Increased diameter	Slight, medium, marked
	Compressed by arteries	Slight, medium, marked
Retina:	Oedema	Slight, medium, marked
	Exudate	Slight, medium, marked
	Haemorrhages	Fresh, organized

Optic disc: (Describe abnormality)

Remarks:

FIG. 13. FORM A 8, IN REDUCED FACSIMILE

tory examinations (routine for urine and blood Wassermann tests) are recorded on *Form A* 7 (Fig. 12). In addition to those listed, other tests applicable to special cases, as for instance spinal fluid tests in

syphilitics, blood clotting time and blood cell counts for haemophilics, etc. are recorded here.

On account of the unique opportunity afforded by the retinal arteries for observing the state of minute arterial vessels, *Form A* 8, covering the examination of the eye grounds, was incorporated. In arranging the questions on this sheet we were guided largely by the important paper of Foster Moore (20). *Form A* 8 is shown in Fig. 13.

Particular attention is directed to the fact that in all these forms for recording the data of both clinical history and physical examination, provision is made for indicating answers to questions in the most simple, direct, and unambiguous manner. Wherever it is practicable the record is made by simply drawing a circle about "yes" or "no," or about one out of several alternatives.

Biometric Forms

These forms, which are shown in Figs. 14 and 15, are used to record the results of the anthropometric data taken on the patient. General directions as to anthropometric technique are to be found in Martin (19), Hrdlička (15), and Davenport (8).

The instruments used in making the biometric examination are as follows:

1. *Scales.* A portable platform scale graduated to fifths of a kilo, and with a capacity of 272.7 kilos. Such a scale may be purchased from John Chatillon and Sons, New York City.

2. *Anthropometer.* A two meter hollow steel rod, graduated in millimeters, and detachable into four sections of equal length. The rod carries a fixed socket at one end, and a sliding socket, into which horizontal metal beams are fitted.

3. *Spreading calipers.* The "larger standard compass" of Hrdlicka's (15) *Anthropometry*, p. 55, with curved arms and a 60 cm. straight rule graduated in millimeters.

4. *Sliding calipers.* A 25 cm. straight rule which is graduated in mm. and which carries one fixed and one sliding metal bar, at right angles to the rule itself.

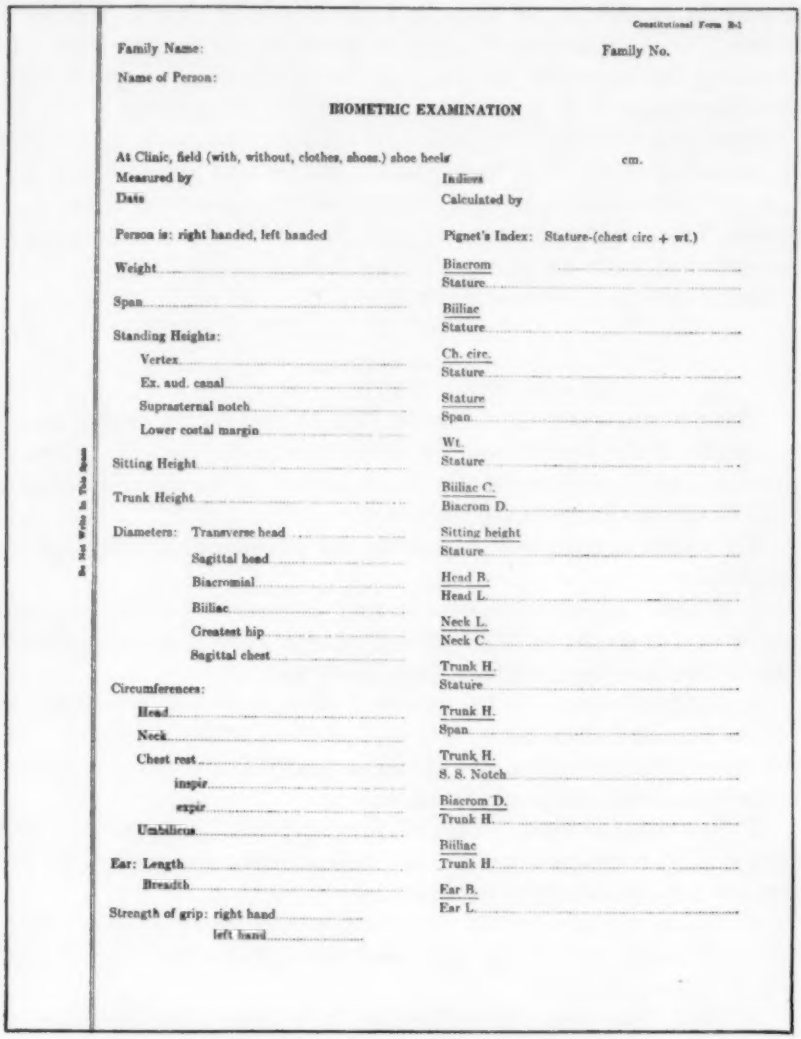
5. *Steel tape line.* Two meters in length and graduated in millimeters.

6. *Hair color standards* of Eugen Fischer.

7. *Skin color standards* of Felix von Luschan.

8. *Eye color standards* of Prof. Rudolph Martin.

These three color standards 6, 7, and 8 are not wholly satisfactory. We use them because they are the internationally accepted standards in the field of anthropology.



Constitutional Form B-1

Family Name: Family No.

Name of Person:

BIOMETRIC EXAMINATION

At Clinic, field (with, without, clothes, shoes.) shoe heels cm.
Measured by Indices
Date Calculated by

Person is: right handed, left handed Pignet's Index: Stature-(chest circ + wt.)

Weight
Span
Standing Heights:
Vertex
Ex. aud. canal
Suprasternal notch
Lower costal margin
Sitting Height
Trunk Height
Diameters: Transverse head
Sagittal head
Biacromial
Biiliac
Greatest hip
Sagittal chest
Circumferences:
Head
Neck
Chest rest
inspir.
expir.
Umbilicus
Ear: Length
Breadth
Strength of grip: right hand
left hand

Biacrom / Stature
Biiliac / Stature
Ch. circ. / Stature
Stature / Span
Wt. / Stature
Biiliac C. / Biacrom D.
Sitting height / Stature
Head B. / Head L.
Neck L. / Neck C.
Trunk H. / Stature
Trunk H. / Span
Trunk H. / S. S. Notch
Biacrom D. / Trunk H.
Biiliac / Trunk H.
Ear B. / Ear L.

Do Not Write In This Space

FIG. 14. FORM B 1, IN REDUCED FACSIMILE

The anthropometer, calipers, steel tape, and color standards were all procured from Alig und Baumgärtel, Präzisions-Messwerkzeugfabriken, Aschaffenburg, Germany. The cost is excessive.

9. *Manumeter.* A simple spring device for measuring strength of grip, graduated in five kilo divisions up to 100 kilos. It is made by

Constitutional Form B-2

Family Name: Family No.

Name of Person:

BIOMETRIC EXAMINATION

Observations: Observed by

Eyes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Hair Color: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 ,24, 25, 26, 27, 28, 29, 30

Fineness: fine, medium, coarse

Curliness: a, b, c, d, e, f, g, h, i, j, k, l

Distribution:

Chest: none, below aver., aver., above aver., excessive

Abdomen: none, below aver., aver., above aver., excessive

Axilla: none, below aver., aver., above aver., excessive, straight, curly

Pubis: none, below aver., aver., above aver., excessive, straight, curly, transverse, vertical

Extremities: none, below aver., aver., above aver., excessive

Skin: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Fat: masculine, feminine, infantile, below aver., aver., above aver., excessive

Neck: below aver., aver., above aver., excessive

Extremities: below aver., aver., above aver., excessive, uniform, proximal, distal

Abdomen: below aver., aver., above aver., excessive, uniform, above umbilicus, below umbilicus

Hips: below aver., aver., above aver., excessive

Breasts: below aver., aver., above aver., excessive

Scapula: convex, straight, concave, marked, moderate, slight

Genitalia: below aver., aver., above aver., excessive, infantile
Testicles: rt.: descended, undescended, varicocele
lt.: descended, undescended, varicocele

Habitus: Asthenic, intermediate, pyknic

Face: 5 cornered, shield, long egg, short egg

Posture: Male: 1, 2, 3, 4, 5, 6, 7, 8
Female: 1, 2, 3, 4, 5, 6

Photograph: not taken, front, side, back
lens aperture used Length of exposure seconds

Do Not Write In This Space

FIG. 15. FORM B 2, IN REDUCED FACSIMILE

the Narragansett Machine Co., Providence, Rhode Island, and catalogued by them as No. 596.

10. *Photographic apparatus*, consisting of

(a) A No. 3 Century Studio Camera, with a Versar Portrait-View lens (F6; 5 × 7) made by the Eastman Kodak Company of Rochester, New York.

(b) Eastman portrait superspeed films, 12.7 × 17.8 cm.

(c) All photographs are made with artificial light. Illumination is secured by the use of two 500 watt projection Mazda incandescent lamps. Each lamp is held in a stand with a reflector, which apparatus is called a "Superlyte" and is made by the Max Mayer Company of New York. The stands are so placed beside the camera that the patient is uniformly lighted with a minimum shadow of the body on the screen. (Cf. Fig. 1 *supra*.) For the highly satisfactory photographic arrangements used in this work we are indebted to Mr. Herman Schapiro, consultant in Scientific Photography on the staff of the Institute.

(d) The background consists of a gray screen painted upon the wall of the examining room, and a wooden platform at the base of the screen. The screen actually used is 190 cm. high and 100 cm. wide, and is blocked off in 10 cm. squares. The screen should be at least 220 cm. high. The zero point on the screen is at the centre of its lower edge. The platform is 147 cm. long, 60.5 cm. wide and 17 cm. high. Its upper surface is divided by a line projected from the zero point of the screen. This line gives a mark by means of which the patient's body can be readily centered.

The distance from the screen to the photographic plate is 1264 cm. This is kept constant by placing the legs of the camera-stand upon a painted pattern on the floor of the room.

It should be understood that with such an arrangement as that here described it is impossible to do any accurate measuring on the photographs. Owing to the necessity of using a comparatively small room for the examining it is impossible to use a long focus lens in taking the photographs. Therefore from a mensurational standpoint the photographs are too much distorted to permit measurement of them. The purpose of the 10 cm. grid painted on the background is merely to help in orientation, etc.

In making the biometric examination the patient is completely undressed and draped in a light sheet. As practically all the patients are ambulant, measurements of height, span, chest and pelvic diameters and circumferences are done with patient standing erect. All other dimensions are taken with the patient sitting on a wooden

bench, having the following dimensions: 45 cm. deep, 60 cm. long, 50 cm. high. In the case of a few debilitated individuals the biometric examination has been carried out with the patient lying on his back on a large wooden table, with his feet at right angles to body and resting against the wall at the end of the table.

First of all the body weight is taken and recorded, and then the following measurements are made:

1. *Span.* The patient stands with feet together, arms extended horizontally, the palms of the hands directed forward, and the tip of the left middle finger lightly touching a wall. The free end of the anthropometer is placed near the left middle finger-tip on the wall. The horizontal beam on the sliding socket is brought lightly against the tip of the right middle finger. The patient is asked to stretch his arms as far as possible, keeping the tip of the middle finger of the left hand as before, and distance from finger tip to finger tip is noted.

2. *Standing height.* The patient stands erect with feet approximated and the visual axis in the horizontal. The free end of the anthropometer is dropped to the floor behind his heels. It is first swung free in the examiner's right hand and is dropped to the floor so that it comes to rest in the vertical plane. The sliding beam is then brought down by the examiner's left hand to touch the bregma and the reading is made.

In similar manner the *external auricular*, the *supra-sternal notch*, and the *lower costal margin* heights are measured. In the first of these the point of the horizontal beam is brought to rest in the *incisura intertragica;* in the second, in the centre of the supra-sternal notch; in the third, on the lowest point of the left ninth costal cartilage.

For the measurement of the *sitting height* the patient sits well back on the wooden bench, resting his whole weight upon it, and none on his feet. He has usually to be specially encouraged to "sit up straight" and to keep the visual axis horizontal. The anthropometer is again swung in the observer's right hand until it comes to rest in the vertical, when its free end is dropped upon the bench between the patient's knees. The lower edge of the horizontal bar is brought to rest on the bregma.

Trunk height is measured in quite the same manner, the horizontal beam being brought to rest in the suprasternal notch. In the case of a short patient we found it advisable to remove an appropriate number of segments from the rod, for the making of these two measurements. The shorter rod is more readily held steadily as a perpendicular.

The diameters are all measured with the spreading caliper. This instrument is held with a branch in each hand, and the pivot resting against the observer's body so that the instrument itself is in the horizontal plane. One's fingers grasp the branches within an inch or so of the free ends. The *transverse* head measurement is found by running the free ends of the caliper in a zig-zag line along the temporo-parietal region above the level of the zygomatic arches. The maximum spread of the caliper is the point at which the reading is made. The *sagittal* diameter's measurement is obtained by holding the free end of the caliper's left arc upon the glabella while the free end of the right is made to traverse the posterior surface of the occiput in the mid-line until the maximum spread can be recorded. In determining the *biacromial* diameters one stands behind the patient and places the tip of each caliper arm on the superior and external border of the acromion process of the corresponding scapula. The *biiliac* diameter is measured in quite the same manner, using the tubercles of the iliac crests as the land marks. By letting the caliper tips slide down the sides of the thighs from the level of the iliac crests, one can note the *greatest hip* diameter at the point of their maximum divergence. The *sagittal diameter of the chest* is taken with the left caliper tip held on the mid-line of the sternum at the level of its junction with the fourth costal cartilages; the right tip is touched to the spinous process opposite this in the horizontal plane. Respiratory excursion is noted and the mean between the inspiration and expiration figures recorded.

Circumferences are all measured with the steel tape line. The two essential points in the making of these measurements are, first, keeping the tape at one horizontal level, and second, avoiding constriction by pulling the tape too tight. The head circumference is measured just above the supra-orbital ridges; the neck, at the level of the lower border of the cricoid cartilage; the chest in a horizontal plane passing through the base of the ensiform cartilage, and the trunk, at the level of the umbilicus.

The left ear is measured in each case because it is the more convenient one for the right-handed examiner. For this the sliding caliper is used. In determining *ear length* the caliper is placed with the rule parallel to the long axis of the ear, its edge touching the anterior curves of the helix and the tragus, and the fixed horizontal bar just touching the most superior point on the helix. The sliding bar is brought into light contact with the most inferior point on the lobule. For the measuring of *ear breadth* the fixed horizontal beam

of the caliper is so placed that its edge touches the anterior curves of helix and tragus, while the sliding beam is brought into contact with the most posterior part of the helix.

Strength of grip is determined by having the patient squeeze the manumeter. He is allowed to hold it at whatever angle he can grasp it most satisfactorily, but the hand and arm must be kept free from contact with the body.

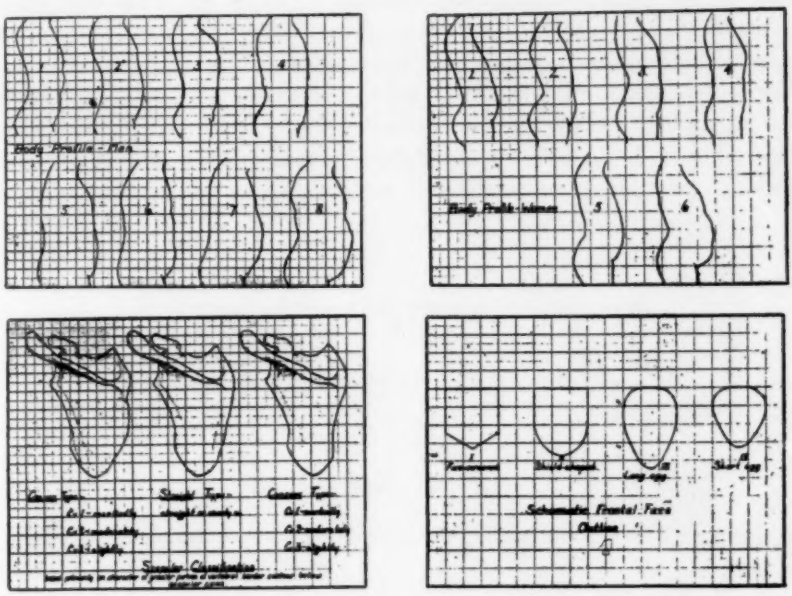


FIG. 16. UPPER DIAGRAMS: STANDARDS FOR RECORDING POSTURE. LOWER DIAGRAMS: LEFT, GRAVES' SCAPULAR TYPES; RIGHT, STANDARDS FOR SHAPE OF FACE

In deciding upon *hair, eye, and skin coloring* the one essential is to make the comparisons with the standards in bright daylight. Observations made by electric light rarely check with those made by daylight. The area of skin chosen for comparison with standards is that of the medial surface of the upper arm or that over the breast, because of the protection of these areas from weathering changes.

The *vertebral borders of the scapula* (cf. Graves (10–14) and earlier papers there cited) can be most readily explored if the patient is allowed to "slouch," and the observer everts the vertebral border by drawing the head of the humerus forward. In the case of very fat patients this determination is, on the whole, rather unsatisfactory. The

diagrams shown in Fig. 16 furnish the standards for recording this point.

The record sheets are self-explanatory as to the *type, quantity, and distribution of hair and fat.* The shape of the face, and posture are recorded according to standards shown in Fig. 16.

Habitus is recorded by checking on a thirteen point scale for the trunk, including the neck, and another thirteen point scale for the legs. This scale is rubber stamped on Form B 2. The zero point of each scale represents the extreme asthenic type, and the twelve point the extreme pyknic. The requisite observations are made during the whole examination, and the impression summarized when the patient stands for the photograph. In our actual work we follow Kretschmer (16) largely in the definition and naming of bodily types. Typing individuals as to somatic habitus is, in the present state of

FIG. 17. DUAL SCALE USED FOR RECORDING HABITUS TYPES

development of the subject, and in view of the great variation in human beings, a rather arbitrary procedure. We have found that, in these circumstances, a more satisfactory classification of individuals can be made by the use of the dual thirteen point scale shown in Fig. 17, than by simply using the three broad verbal classes, asthenic, athletic (or intermediate), and pyknic.

Three photographs of the patient are made in each case, a back, front and lateral view, as shown in Fig. 18, for an achondroplastic dwarf.

In making these photographs the patient, for the front view, has a black tape or elastic band tied about the body at the level of the iliac crests. He stands with feet symmetrically placed one on each side of the line marking the middle of the platform, and with shoulders and buttocks lightly touching the screen. In focusing the lens, the curves of the patient's shoulders and calves, and the lines on the screen in their respective vicinities, are watched to obtain maximum

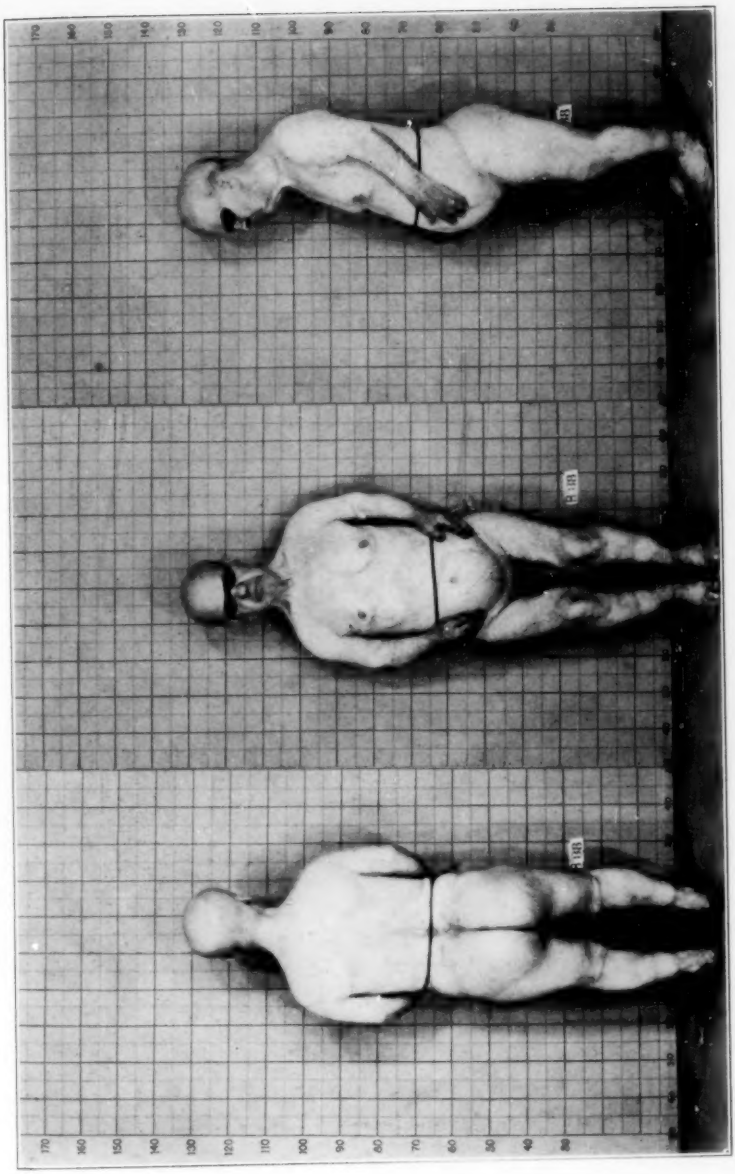


FIG. 18. PHOTOGRAPHS OF A PATIENT HAVING ACHONDROPLASTIC DWARFISM

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sharpness of image. Using the *f* .11 stop, an exposure of one second is made.

For the lateral view the patient places his feet together so that the centre line of the platform passes beneath his midtarsal joints, and his left arm just touches the screen. For the posterior view the patient stands with feet symmetrically placed one on each side of the line, and the anterior abdominal wall in light contact with the screen. Usually it is necessary to ask the patients to look straight ahead, for they tend to throw the head back and look up. In order to have an uninterrupted anterior line in the profile, the patient is asked to hold his arms straight downward and not to let them curve forward.

Home Environment

Questions 1–9 on this *Form C* 1 (Fig. 19) are designed to elicit as accurate a picture as possible of the circumstances—physical, social, moral, and economic—under which the patient and his family live. Under question 9 it has been found in practice impossible in a certain number of cases to get any precise statement, in figures, as to family income. In such cases the social-economic status of the family is estimated by the field worker according to the following scale: high, average American, low, very low.

Since *Form C* 1 is filled in by the field worker, who has opportunity to see and to interview many members of the family, questions 10 and 11, relating to kinship, marriages and familial diseases, were added to this sheet.

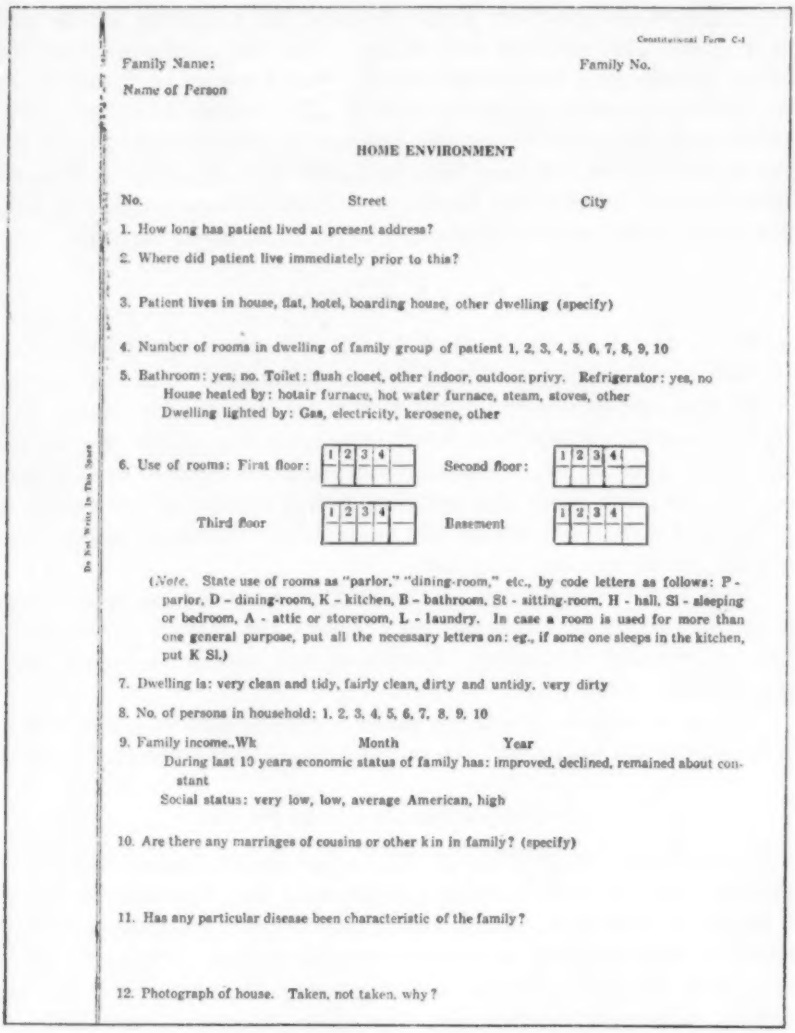
The field worker invariably takes a photograph of the house of each patient she visits, and this is pasted on the reverse of *Form C* 1.

Individual Family Record Forms

These *Forms D* 1–3 (Figs, 20–22) are condensed from *Forms A* 1–8. They are used to record clinical and physical data on certain members of the patient's family, namely father and mother (grandparents where possible), sibs, children, grand-children, the consort (or consorts where more than one with children by the patient), the consort's father and mother, sibs and children by any other marriages, provided the patient has had children by such consort.

Every effort is made to get this information by actual interviews with the individuals, whether at their home, places of work, or at the dispensary or in the hospital wards on their visits to the patient.

This is primarily the business of the field worker, but often the assistant physicians share in this work. Not infrequently, especially



Constitutional Form C-1

Family Name: Family No.

Name of Person

HOME ENVIRONMENT

No. Street City

1. How long has patient lived at present address?
2. Where did patient live immediately prior to this?
3. Patient lives in house, flat, hotel, boarding house, other dwelling (specify)
4. Number of rooms in dwelling of family group of patient 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
5. Bathroom: yes, no. Toilet: flush closet, other indoor, outdoor privy. Refrigerator: yes, no
   House heated by: hotair furnace, hot water furnace, steam, stoves, other
   Dwelling lighted by: Gas, electricity, kerosene, other
6. Use of rooms: First floor: 1 2 3 4 Second floor: 1 2 3 4
   Third floor 1 2 3 4 Basement 1 2 3 4

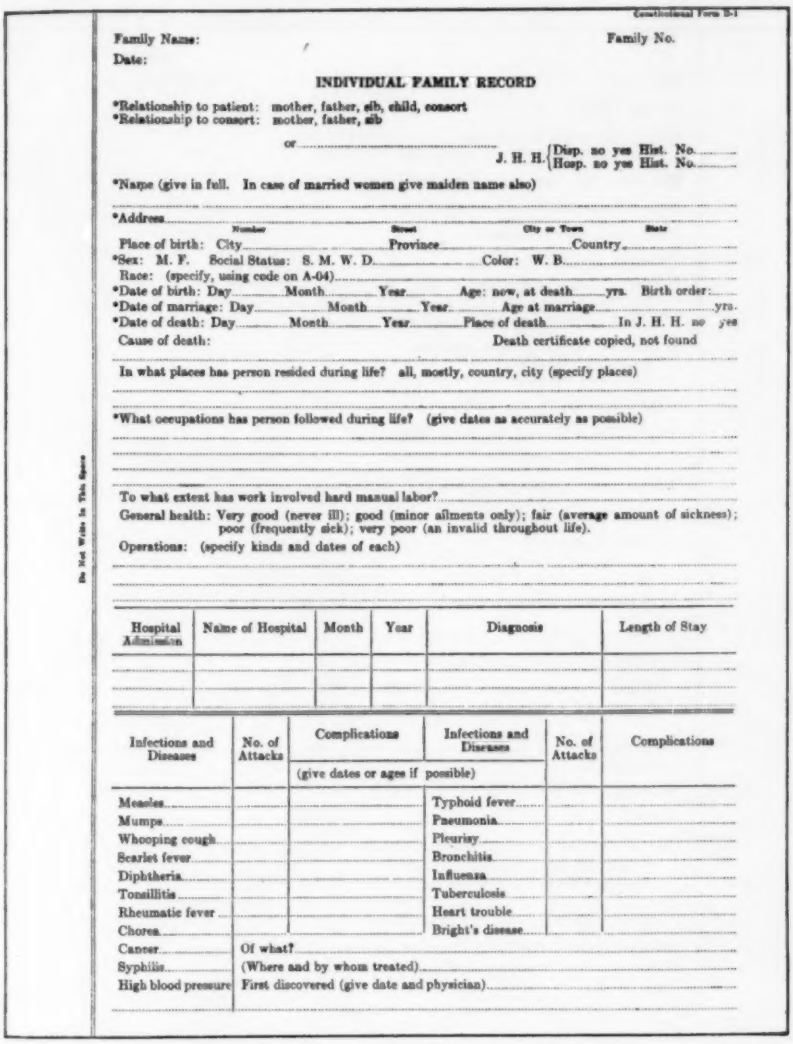
   (*Note.* State use of rooms as "parlor," "dining-room," etc., by code letters as follows: P - parlor, D - dining-room, K - kitchen, B - bathroom, St - sitting-room, H - hall, Sl - sleeping or bedroom, A - attic or storeroom, L - laundry. In case a room is used for more than one general purpose, put all the necessary letters on: eg., if some one sleeps in the kitchen, put K Sl.)
7. Dwelling is: very clean and tidy, fairly clean, dirty and untidy, very dirty
8. No. of persons in household: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
9. Family income.,Wk Month Year
   During last 10 years economic status of family has: improved, declined, remained about constant
   Social status: very low, low, average American, high
10. Are there any marriages of cousins or other kin in family? (specify)
11. Has any particular disease been characteristic of the family?
12. Photograph of house. Taken, not taken, why?

Do Not Write In This Space

FIG. 19. FORM C 1, IN REDUCED FACSIMILE

where engagements can be made to interview several members of a family at one time, one of the assistant physicians accompanies

the field worker. Of necessity many visits are often made out of working hours, in the late afternoon, at night, or on Sundays.



Constitutional Form D-1

Family Name: Family No.

Date:

INDIVIDUAL FAMILY RECORD

*Relationship to patient: mother, father, sib, child, consort
*Relationship to consort: mother, father, sib

or ..... J. H. H. {Disp. no yes Hist. No. ..... Hosp. no yes Hist. No. .....

*Name (give in full. In case of married women give maiden name also)

*Address ..... Number Street City or Town State

Place of birth: City ..... Province ..... Country .....

*Sex: M. F. Social Status: S. M. W. D. ..... Color: W. B. .....

Race: (specify, using code on A-04) .....

*Date of birth: Day ..... Month ..... Year ..... Age: now, at death ..... yrs. Birth order: .....

*Date of marriage: Day ..... Month ..... Year ..... Age at marriage ..... yrs.

*Date of death: Day ..... Month ..... Year ..... Place of death ..... In J. H. H. no yes

Cause of death: Death certificate copied, not found

In what places has person resided during life? all, mostly, country, city (specify places)

*What occupations has person followed during life? (give dates as accurately as possible)

To what extent has work involved hard manual labor?

General health: Very good (never ill); good (minor ailments only); fair (average amount of sickness); poor (frequently sick); very poor (an invalid throughout life).

Operations: (specify kinds and dates of each)

Do Not Write In This Space

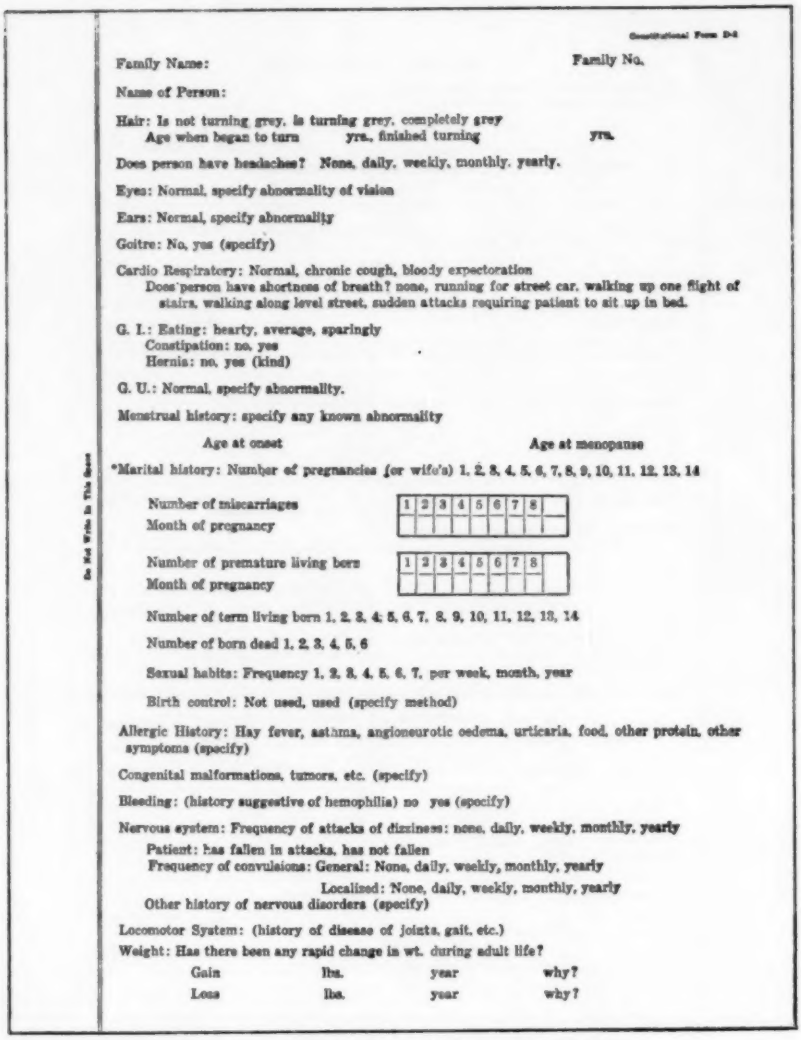
Hospital Admission	Name of Hospital	Month	Year	Diagnosis	Length of Stay

Infections and Diseases	No. of Attacks	Complications (give dates or ages if possible)	Infections and Diseases	No. of Attacks	Complications
Measles			Typhoid fever		
Mumps			Pneumonia		
Whooping cough			Pleurisy		
Scarlet fever			Bronchitis		
Diphtheria			Influenza		
Tonsillitis			Tuberculosis		
Rheumatic fever			Heart trouble		
Chorea			Bright's disease		
Cancer	Of what?				
Syphilis	(Where and by whom treated)				
High blood pressure	First discovered (give date and physician)				

FIG. 20. FORM D 1, IN REDUCED FACSIMILE

Where the information recorded is derived directly from the person concerned the fact is indicated by writing the word "primary" on the right hand upper corner of *Form D* 1.

Where an individual cannot be seen (dead, out of reach, or refuses to cooperate) the forms are filled out from information derived from



Constitutional Form D-2

Family Name: Family No.

Name of Person:

Hair: Is not turning grey, is turning grey, completely grey
Age when began to turn yrs., finished turning yrs.

Does person have headaches? None, daily, weekly, monthly, yearly.

Eyes: Normal, specify abnormality of vision

Ears: Normal, specify abnormality

Goitre: No, yes (specify)

Cardio Respiratory: Normal, chronic cough, bloody expectoration
Does person have shortness of breath? none, running for street car, walking up one flight of stairs, walking along level street, sudden attacks requiring patient to sit up in bed.

G. I.: Eating: hearty, average, sparingly
Constipation: no, yes
Hernia: no, yes (kind)

G. U.: Normal, specify abnormality.

Menstrual history: specify any known abnormality

Age at onset Age at menopause

*Marital history: Number of pregnancies (or wife's) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Do Not Write In This Space

	1	2	3	4	5	6	7	8	
Number of miscarriages									
Month of pregnancy									

	1	2	3	4	5	6	7	8	
Number of premature living born									
Month of pregnancy									

Number of term living born 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Number of born dead 1, 2, 3, 4, 5, 6

Sexual habits: Frequency 1, 2, 3, 4, 5, 6, 7, per week, month, year

Birth control: Not used, used (specify method)

Allergic History: Hay fever, asthma, angioneurotic oedema, urticaria, food, other protein, other symptoms (specify)

Congenital malformations, tumors, etc. (specify)

Bleeding: (history suggestive of hemophilia) no yes (specify)

Nervous system: Frequency of attacks of dizziness: none, daily, weekly, monthly, yearly
Patient: has fallen in attacks, has not fallen
Frequency of convulsions: General: None, daily, weekly, monthly, yearly
Localized: None, daily, weekly, monthly, yearly
Other history of nervous disorders (specify)

Locomotor System: (history of disease of joints, gait, etc.)

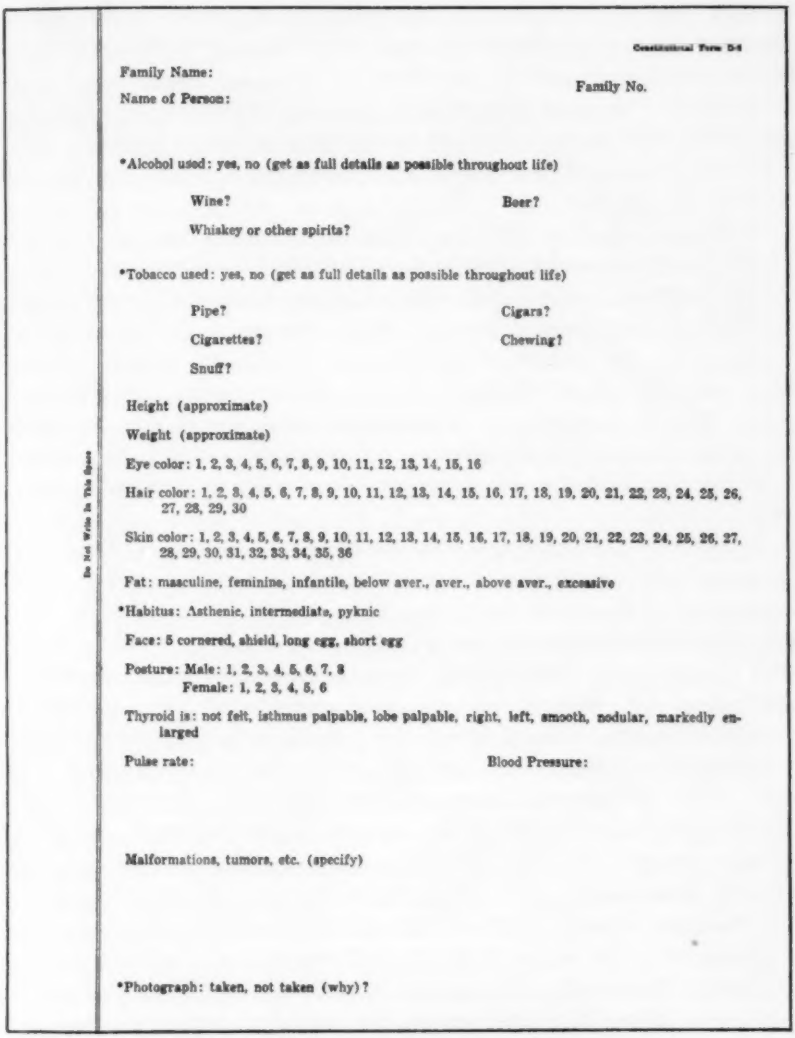
Weight: Has there been any rapid change in wt. during adult life?

Gain	lbs.	year	why?
Loss	lbs.	year	why?

FIG. 21. FORM D 2, IN REDUCED FACSIMILE

the person in the family who knows him best, the patient, his mother, the consort, the consort's wife, etc. In such instances the word

"secondary," with the name and relation of the person supplying the information, is written on *Form D* 1.



Constitutional Form D-4

Family Name:

Name of Person: Family No.

*Alcohol used: yes, no (get as full details as possible throughout life)

Wine? Beer?

Whiskey or other spirits?

*Tobacco used: yes, no (get as full details as possible throughout life)

Pipe? Cigars?

Cigarettes? Chewing?

Snuff?

Height (approximate)

Weight (approximate)

Eye color: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

Hair color: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30

Skin color: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Fat: masculine, feminine, infantile, below aver., aver., above aver., excessive

*Habitus: Asthenic, intermediate, pyknic

Face: 5 cornered, shield, long egg, short egg

Posture: Male: 1, 2, 3, 4, 5, 6, 7, 8
Female: 1, 2, 3, 4, 5, 6

Thyroid is: not felt, isthmus palpable, lobe palpable, right, left, smooth, nodular, markedly enlarged

Pulse rate: Blood Pressure:

Malformations, tumors, etc. (specify)

*Photograph: taken, not taken (why)?

Do Not Write In This Space

FIG. 22. FORM D 3, IN REDUCED FACSIMILE

In practice a definite routine has been evolved. The assistant physician who examines a patient fills in the record sheets for family

members for whom it is evident that the patient is the only (as in out of town cases, deceased father and mother, consort or children), or the most reliable source of information. With dispensary and ward patients from out of town this duty falls *entirely* upon the examining physician (unless by chance the patient has a relative living in Baltimore), and in such cases all the D forms are based upon "secondary" information. In cases of unusual importance the assistant physicians sometimes visit by appointment family groups living far from Baltimore, in order to complete family records and to examine and measure relatives of patients.

In many instances the examining physician or the physician in charge of records seeks additional information by correspondence on such important points as names, sex, ages, pregnancies, the occurrence of certain symptoms and diseases (particularly familial diseases and peculiarities), the nature of and reason for surgical operations, and the causes of death of members of the patient's family. Correspondence of this type is frequently conducted with physicians, hospitals, and departments of vital statistics. Sometimes out-of-town patients have relatives in Baltimore from whom valuable information may be obtained.

Whenever relatives, for whom individual record sheets have been obtained, have at some earlier date been examined or treated in the dispensary or wards of the Johns Hopkins Hospital, their hospital histories are abstracted and made a part of our records. Such histories, often dating back many years, furnish important data concerning ages, marriages, number of sibs, and pregnancies, the occurrence or non-occurrence of various infectious diseases, particularly diseases of childhood, tuberculosis, syphilis, etc. Records extending over many years of blood pressure, urinary and other laboratory tests, body weight, heart lesions, goitre, tumors; and of surgical operations are thus frequently obtained. Records of negative findings, with dates of examination, are often of importance. In many instances these histories furnish valuable information concerning births, number of pregnancies, the cause of death and the age at death of various members of the family. Sometimes information so derived is entirely new, and in many instances serves as a valuable check on statements made by the patient or other informers.

Whenever a relative of the patient, particularly one with the same affection or with some other disease of interest, can be persuaded to comply, he or she is admitted to a complete examination, with bio-

metric measurements and photographs, in every way similar to the patient's. These records later take the place of the D forms.

FIELD WORK

As previously pointed out, if the patient is from out of town and has no relatives in Baltimore, all the data concerning the patient and family are obtained by the examining physician.

In all other cases, forming by far the largest part of our material, after the examining physician has completed the examination of the patient, abstracted the several histories, recorded all the genetic data obtainable from the patient, and filled in all the individual family records falling within his or her province (as indicated in the preceding section) the family is turned over to the field worker. Upon her intelligence, tact, patience and persistence depends the further progress of the case.

It is of the greatest importance that the field worker be armed with all the available data before undertaking her first visit to the home. A false step on her part, as for instance a hint that the patient is being treated for syphilis, when applying to the consort or other relative for information, may effectually block all further inquiries. On the other hand evidence of a sympathetic understanding of the patient's affection, as with hypertension, cancer, etc., may open the door to a fund of information. The mere knowledge on her part that a child in the family has been treated in the dispensary or hospital may be turned into the means of a favorable reception.

Having obtained all the information possible, by leading the informant, usually a mother, aunt, daughter, or consort, to tell the story in his or her own way, the field worker takes up the genealogy anew. Genetic records so obtained may run into hundreds of names. In this connection of special importance is the additional information the field worker obtains concerning the number of pregnancies, stillbirths, miscarriages, abortions (often induced) and illegitimate children, among the women of the family. She is constantly on the lookout for special family traits, familial diseases, malformations, tumors and various other diseases among the members of the family.

Since she is specially trained and carries with her the necessary standards for recording eye, hair and skin color, posture, face shape, etc., and a blood pressure gauge, the field worker's individual kin records (*Form D* 1-3) equal in accuracy those of the examining physicians.

Having exhausted the other sources of information concerning a family, the field worker next endeavors to persuade as many as possible of the near relatives of the patient to come to the dispensary for complete examination, measurement, and photographing by the assistant physicians. For recording these, Forms A 1-8 and B 1-2 are used just as with the patients. In some families these complete examinations have been made on as many as seven individuals. The success of the field worker in this feature of her work is influenced favorably to a considerable degree by her automobile with which many persons are brought in, especially the aged, cripples, and young children, whom it would be impossible to get otherwise.

Another important duty of the field worker is to obtain accurate information of the age and cause of death of all deceased members of the family. To this end she obtains from the City and State Health Departments copies of death certificates. In this connection she reads the daily death notices in the local paper. All deaths thus verified by death certificates as to name, sex, age and address are recorded with the appropriate family histories.

In addition to visits to homes, information concerning patients and members of their families is obtained through City and State Departments and Institutions (including penitentiaries and jails), other hospitals, and welfare institutions and associations.

A family is held in work until every reasonable source of information is exhausted—in many instances for months. During the progress of the case frequent consultations are held between the field worker, the examining physicians, the physician in charge of records, and the head of the division. Not until it is decided by the Director of the Institute, in conference, that the records are as complete as possible, is the pursuit abandoned.

With many important cases, especially cancer cases from out of town, it is of course impossible to get much first hand information in regard to members of the patient's families, even through correspondence. On the other hand, in some families apparently unpromising at first, a surprising lot of accurate information may be obtained.

FINAL ASSEMBLING OF RECORDS

When the field worker and the examining physicians have completed their work, the physician in charge of the office records checks the data, and arranges the records in proper sequence. Here the first step is to review critically, for errors of omission or of commission,

each item in the history and examination of the patient and those members of his family for whom special records (Forms A 1–8, B 1–2; or D 1–3) have been obtained. Omissions and apparent errors are recorded on a page assigned to the family in a work book, and copies are given to the assistant physicians and the field worker for completion and correction.

A second step comprises a careful inspection of the genetic sheets (Forms A 02–03), in order to become familiar with the family ramifications, and if necessary to rearrange names and birth orders, and to see that all stillbirths, miscarriages and abortions recorded in the individual histories are accounted for. It is also important to see that the ages, causes of death, and the dates of death are stated, and that the presence or absence of certain particular diseases or symptoms in various individuals are noted opposite their names. Then only is the material ready for finally compiling the genetic chart, which serves the purpose of a synopsis and index of the family history.

The case is now ready for assembly and presentation for conference, and finally binding. The assembly order is as follows: the genetic chart, the genetic and race code sheets, the patient's section (Forms A 1–8, B 1–2 and C 1) and lastly the history sheets (D 1–3) of other family members, in serial order according to the numbers in red ink on the genetic chart. To facilitate this end every page of each person's history—including the patient's—every abstract, photograph, and death certificate bears the number in red ink of the person to whom it appertains.

In arranging the patient's history all clinical, biopsy and autopsy abstracts are filed between Form A 8 and Form B 1. Photographs are filed between Forms B 2 and C 1.

Pertinent notes and death certificates concerning relatives are similarly filed with their histories. Death certificates of individuals for whom no histories have been obtained are filed in their appropriate places according to the person's genetic chart number.

From start to finish, while in work, all the records of each case are kept in a paste-board folder, with the genetic forms. The patient's history, and the history of each relative are secured separately with suitable clips. The completed family history is bound as a volume after it has been passed in the weekly staff conference.

After a case is completed and bound we endeavor, at intervals, to keep in touch with the patient by correspondence or personal visits, in order to get as much knowledge as possible regarding the

subsequent course of events. The results of such efforts are recorded and inserted in the bound histories at the appropriate places.

For each person undergoing complete examination with biometric measurements and photographing, two index cards, bearing the name of the individual, the family number and the diagnosis, are made out. One set is filed by family number and the other alphabetically. The photographic films, with extra prints, are filed serially by family number in folders marked with the family, the individual, and the photograph number, and the name of the person photographed.

The case is then ready for analytical and statistical study.

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ENTRENCHED NEGRO PHYSICAL FEATURES

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INTRODUCTION

There are specific features characteristic of human Stock. Since these are unequally affected by hybridization some must be more entrenched than others. The analysis of quantitative determinations should therefore give an index of stability of physical pattern.

The American Negro provides excellent material for this study. His African ancestry is as heterogeneous as that of the European peoples with which his blood is mixed. In addition he has quite a contribution from the American Indian (3). With such a clot of blood relationships as his heritage he is now segregated by social convention, the cramping effect of which has progressively reduced infusion of White blood during the last three generations (3). The Indian contribution is already a thing of the past. We have therefore in our midst, most favorably situated for study, a people fast becoming more homogeneous and developing a physical type of its own.

The bodies upon which this investigation has been pursued are the *enfants perdus* of a large city, industrious fellow-townsmen, gentlemen-rankers, broken men and professional paupers gathered by accident, misfortune or design into a common net by lack of funds for burial. This is sometimes the definite intention of the deceased or his relatives, quite frequently the result of temporary financial embarrassment, but often due to personal incompetence or misfortune. Whatever the cause our selection gives a fair cross section of Cleveland's population, both White and Colored, excepting the financially stable.

Our method of selecting standard samples, our reasons for accepting female samples which do not attain the full tally of 100, our uniform method of measurement and its safeguards, and our selection of seventy-five physical traits for quantitative determination have all been presented (12, 13). No subdivision of Whites by geographic

origin or race and no segregation of Whites or Negroes by occupation are practicable upon such a company. Such records are open to grave question even when the data are obtained from the individuals themselves: the clinical records at death give no reliable information.

POSSIBLE LINES OF INVESTIGATION

Discrimination of physical characters may be based upon features which are actually indices of function or upon those which denote form alone. Attention hitherto has been focussed by us more especially upon the former. Examples are sutural closure, epiphysial union and the architectural patterns of muscles.

Half a century ago, in a political setting very different from that of today, French anthropologists emphasized an assumed difference between Whites and Negroes in the order of suture closure. The skull of the White Man, said Gratiolet (1), "is a temple divine but that of brutish races is merely a helmet constructed to ward off heavy blows." This remarkable distinction was based upon the supposition, supported by wholly insufficient evidence, that closure of the coronal suture before the lambdoid occurs in the Negro but not in the White. Lyon and I have demonstrated that there is no distinction at all between Whites and Negroes in the order of suture closure or in the age at which it occurs (9).

In date of epiphysial union again it has been persistently assumed that some distinction might be found between human beings even less diverse than Whites and Negroes. Stevenson (7) and later D'Errico and I (10) have shown the baselessness of this assumption.

Stock-linked characters have often been alleged in architectural pattern of muscles or their tendinous attachments. Hallisy, in a comprehensive study of 150 pairs of feet, soon to be published, shows conclusively that no Stock distinctions can be found even in this part of the body, where differences might be expected if they occur at all (2).

It is, however, conceivable that distinctions in form pattern may give us the clues we seek when indices of function fail to discriminate between nearly related creatures capable of producing fertile hybrids. Dimensions with their ratios and variabilities must therefore claim our attention. Lack of adequate female samples for comparison confines us to a discussion of males alone.

DIMENSIONS AND RATIOS

Of the seventy-five dimensions studied six limb circumferences and one other feature, namely body weight, were found to be so much altered by the change from life to death that they are inadmissible (12). Three others, being alternative measurements in the leg, were also eliminated.

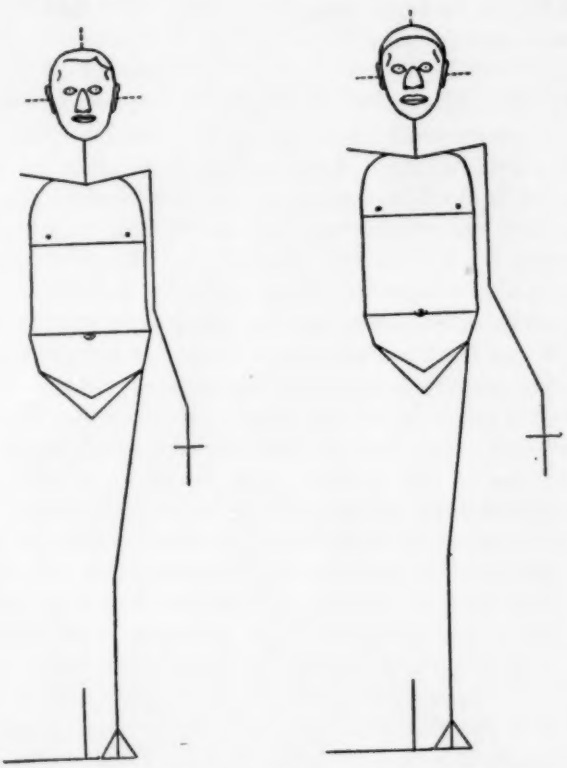

FIG. 1. GRAPHIC OUTLINES OF MALE WHITE (LEFT) AND MALE NEGRO (RIGHT) CONSTRUCTED FROM AVERAGE DIMENSIONS IN OUR STANDARD SERIES (12)

Small as the differences appear in relation to the mean values their cumulative total makes discrimination easy between the two outlines.

Examination of our results upon the remaining sixty-five traits presents little to strike the imagination. Our male Whites are below average stature and our male Negroes above it, facts which indicate that comparison of simple dimensions cannot be very profitable.

Nevertheless the graphic outlines of average dimensions presented in figure 1 obviously carry differentiation in appreciable degree. Hence dimensions or their ratios deserve close attention.

Since average stem-length is identical in the samples, torso measurements can be directly compared. Negro chest circumference is somewhat less than White, owing to a reduction in dorso-ventral diameter rather than to a more gracile form. The Negro nipples are slightly higher in location than the White. We find this true also in our females and perhaps the anchoring of the female breast higher on the Negro is to be associated with the flatter chest. The narrow pelvis and lower iliac crest of the Negro are important features which can often but not invariably be relied upon to mark blood relationships. It is rather striking that, despite differences in torso dimensions, average umbilical level is identical in the two Stocks.

The slightly higher suprasternal notch and longer arms of the Negro account for the greater breadth and droop of his shoulders.

The faces also of the two Stocks can be directly compared, for there is no basis save stature against which they can be plotted and this basis is far from satisfactory. Direct determination gives no new light and merely emphasizes distinctions already well known. The hair line is lower on the forehead of the Negro. His interocular breadth, interpupillary distance, lower-nasal breadth and lip thickness are greater than in the White. It is, however, worth noting that average nasion-prosthion length is the same in both Stocks in spite of the greater total facial height of the Negro. Since the Negro nose or nasion-nasospinale height is short the nasospinale-prosthion dimension is greater than in the White. Facial breadths show no differences in our samples, probably because our Whites include enough central Europeans to give unexpectedly large average dimensions.

The longer Negro limbs preclude direct comparison. We must determine all limb dimensions in terms of the total length of arm or leg. This has already been done (12) so that we need but recapitulate our findings. The Negro upper arm is somewhat short but this is practically compensated by his slightly longer forearm. Hand length and breadth, like acromial breadth, are strictly proportionate to total arm length. Thigh, shin and foot lengths are proportionate to leg length; so also is foot breadth. The long shin of the Negro is an illusion of its circumference, as his long foot is an illusion of its flatness. There is, however, a difference in the setting of the heel fully discussed by Straus (8).

So far as dimensions and ratios go our investigation has added nothing new to our knowledge. It has determined the manner in which such comparisons must be made and has indicated that they are of little value for individuals though of considerable significance for comparison of group averages. It has forced us to the contemplation of contours for determination of individual distinctions and to variabilities for the comparison of population samples.

THE PELVIS

In spite of its not being so stable in Stock-linkage as I once hoped, some reference should be made to the pelvis as an independent variable,

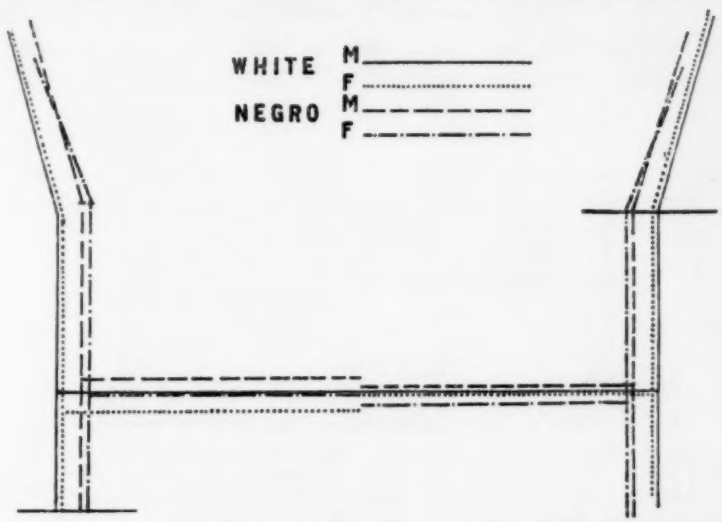

FIG. 2. PELVIC FORM PRESENTED IN ACTUAL DIMENSIONS

The vertical sides are fictitious: they emphasize only the interspinous diameter. Horizontal line at upper level of symphysis. Left side of diagram erected on tuber ischii; right side centered on anterior superior spine. White pelvis broader than Negro: sex differences slight. Symphysis low in White.

even though full consideration is impossible at the moment. For individual discrimination the pelvis may be unreliable; its dimensions and ratios are not very firmly entrenched. Nevertheless for group averages it is useful enough. Figures 2 and 3 have been prepared to illustrate the Stock-linked pelvic dimensions. Height above perineum (practically ischial tuber in the dead) of upper symphysial border, of anterior superior iliac spine and of iliac crest; bicristal and bispinous diameters are all recorded. Figure 2 is drawn from

absolute dimensions, and since the pelvic heights themselves are variable, the left side of the diagram is erected upon the ischial tuber as a common base whereas the right side centers on the anterior superior iliac spine. Most of the observations made on bispinous diameter and many even of those on bicristal diameter are not to be trusted. They are difficult and embarrassing measurements, often grudgingly permitted, but those recorded here have been checked later by measurement of the fresh pelvis before maceration. The vertical sides of the diagram are fictitious.

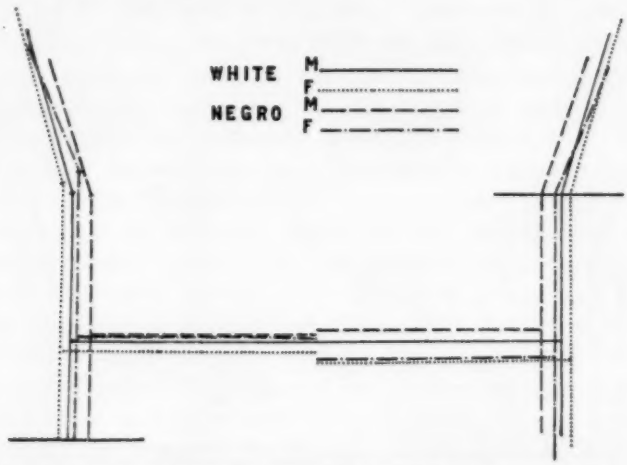

FIG. 3. PELVIC FORM PRESENTED IN RELATIVE PROPORTION

General arrangement as in Figure 2. Transverse diameters proportional to torso length; vertical measurements proportional to leg length. White pelvis relatively broader and symphysis lower than Negro. Female relatively broader and symphysis lower than male.

Total pelvic height and height of iliac crest above spine are great in Whites, whereas symphysial upper border is low. In absolute dimensions the female pelvis is somewhat narrower than the male and her symphysis is lower.

Figure 3 is presented in the same manner as figure 2 but instead of absolute dimensions, pelvic breadths are presented in terms of torso length and pelvic heights in terms of leg length. The female pelvis is relatively broad and its symphysis low, but the sexual differences are surprisingly small. The Negro pelvis is narrower than the White relatively as well as absolutely, but relative pelvic heights maintain proportions similar to those of the absolute dimensions.

COMPARISON OF NEGRO SAMPLES

Our investigation has reluctantly disclosed divergences of no great amount between the dimensions of White and Negro males. We have, however, still to put these divergences to the test of hybridization in varying degrees. Fortunately there are other Negro samples of a totally different character ready to hand. Herskovits obtained a sample of 496 young adult male Howard University students, of whom 109 were unable to trace any White admixture in their ancestry. With characteristic courtesy Doctor Herskovits permits reference to his figures, although few have yet been published (see 3). We shall therefore speak of his 496 students as the Howard general series and the 109 as the Howard Negro group.

Table I is a comparison of average dimensions with our own series flanking those of Herskovits. Sitting height (i.e. stem length in the

TABLE I

Actual average values in mm. of physical traits. Columns from left to right: Western Reserve standard male Negro series; 109 male students denying White admixture; 496 male students of general American Negro stock; Western Reserve standard male White series

MEASUREMENT	W.R.U. NEGRO	HOWARD UNIVERSITY		W.R.U. WHITE
		Negro	General	
Pigmentation	83	75	66	
Stature	1744	1704	1711	1706
Stem length	886	873	882	886
Head length	193	198	197	188
Head breadth	149	152	152	154
Auricular height	124	134	134	120
Forehead breadth	107	106	106	106
Bizygomatic breadth	139	141	139	139
Upper facial height	71	72	71	69
Total facial height	125	124	123	122
Nasal height	51	53	54	54
Lower-nasal breadth	42	43	41	35
Thickness lips	21	24	22	12
Interpupillary distance	68	68	66	63
Phys. height ear	61	60	60	67
Pelvic breadth	270	286	285	292
Width mouth	56	55	53	53

dead), possibly stature, and pelvic breadth must be ruled out of comparison because of possible differences in technique. Head length and auricular height must also be eliminated because of the differences in social standing.

With these excisions there are left three groups of dimensions all of significance. Forehead and bizygomatic breadths together with upper facial height remain the same throughout the table as a common human heritage of these samples despite the diverse origins. Pigmentation, head breadth, total facial height and nasal height show a definite progression with our Negroes at one end of the scale. These then are features readily modified by hybridization. But the most significant figures are those for nasal breadth, thickness of lips, mouth width, interpupillary distance and ear height. Some allowance, it is true, must be made for dehydration in death in nasal breadth and lip thickness (see 12) and for self conscious pose in mouth width. But having made such allowances, the obvious uniformity of dimension despite difference of sampling means that we have unearthed features relatively little affected by hybridization.

Once again there is nothing new in our results, though the work has served to emphasize diversity in the degree of entrenchment of physical traits. The fact that we have added none to the list of entrenched characters already well known is explained by the lack of data available for comparison with ours. If energy is bent definitely towards the search for entrenched characters and measurements are made of sufficient traits on ample series it is quite possible that we shall add others to our present list.

VARIABILITIES

Because of inadequate data for comparison we must leave unfinished the measurement of entrenched features and turn our attention to group characters. The relative stability of these can be conveniently expressed by their tendency to variation. Admitting the theoretic objections to Pearson's coefficient of variation and its inapplicability to the comparison of mean values of diverse traits, we find it of great value for comparing the same trait in different samples, sexes or Stocks.

Arbitrary evaluation of the trait variabilities set forth in our former analysis (12) serves no useful purpose. Distinctions must be of much broader scope. The tables show that the Negro male is consistently more variable than the White male in all limb dimensions

both of leg and arm including shoulder breadth; in pelvic diameters, chest circumference and depth; but not in torso length, transverse chest and internipple breadth. In none of these except possibly the last three is there any tendency to stability of pattern in our hybrid Stock.

TABLE II

Negro variability less than White Among 65 traits

MEASUREMENT		MALE WHITE		MALE NEGRO	
		Mean	C. of V.	Mean	C. of V.
27.	Ventral torso length	516	8.02	513	4.81
36.	Chest breadth	273	8.06	272	6.73
38.	Inter-nipple breadth	194	12.01	191	8.93
IX.	Inter-ocular	33	10.61	35	7.79
XIII.	Lower-nasal breadth	35	10.53	42	8.67
XIV.	Mouth breadth	53	8.69	57	7.17
XVII.	Trichion gnathion	189	6.34	194	5.05
XVIII.	Nasion gnathion	122	7.92	125	6.01
XX.	Nasion prosthion	69	9.05	71	7.81
XXV.	Interlabral height	12	32.15	21	23.42
XXXII.	Morph. ear breadth	50	10.16	46	9.31
	Pigmentation (female)	33	12.94	70	8.68
	Total 12				

TABLE III

Negro variability greater than White Among 65 traits

MEASUREMENT		MALE WHITE		MALE NEGRO	
		Mean	C. of V.	Mean	C. of V.
16.	Sphyrion height	73	13.60	69	15.51
29.	Head neck length	311	4.88	306	6.20
41.	Iliospinous breadth	246	6.97	227	7.96
43.	Ext. conjugate	190	5.04	184	9.10
45.	Entire arm	760	3.97	799	5.16
46.	Arm length without hand	569	4.20	598	5.59
47.	Upper arm	333	4.93	340	6.42
49.	Hand length	187	4.97	199	6.15
61.	Chest circumference	837	8.45	830	9.45
VIII.	Bigonial	110	6.74	109	7.96
XXII.	Nasal depth	21	14.66	16	18.34
	Total 11				

Ear and cranial dimensions, or any involving auricular height; nasal height and septum length (nasal depth), together with two which are dubious on the dead, namely palpebral fissure breadth and bigonial diameter, are all equivocal in their variability and must be set aside as also unstable in pattern.

All facial dimensions apart from those just mentioned are plainly less variable even in our hybrid Negro males than in our heterogeneous White males. It is upon these therefore that we must fasten for investigation of entrenched characters.

So far then as it is possible to pursue the argument in the present unsatisfactory state of our knowledge the stable hereditary Negro pattern is to be sought in facial features. This is of course in accordance with general usage. But there is still a further line of examination to be glanced at before we close this review.

COMPARATIVE VARIABILITIES IN HYBRIDS AND PURER STOCKS

Any search for a pure Stock in the world of today must be doomed to failure. Homogeneity is the result of local isolation rather than of uniformity in ancestry. Nevertheless some Stocks are purer than others, and we may well submit our Negro hybrids to comparison with West African people, whose opportunity for White admixture is less than theirs. Unfortunately the haphazard selection of traits for measurement and the small number of observations made hitherto by anthropologists in the field seriously limits the material at our disposal.

Rattray's observations on the Ashanti (6) have been statistically reduced by Herskovits, who again permits me to quote his figures. For contrast we have Herskovits' reduction of Hrdlička's data on the Old Americans (4). Even so we can muster only eight traits for comparison. These are set forth in figure 4, which is a scaled diagram of percentage variabilities (coefficients of variation) of our White and Negro populations compared with those of Rattray's Ashanti and Hrdlička's Old Americans.

Variability of the readily modifiable characters head breadth and nasal height has been increased in our male Negroes by hybridization. But head length and forehead breadth show no greater increase of variation than in our heterogeneous male Whites compared with the Old Americans, despite the fact that there is actual Stock crossing in our Negroes. Stature, bizygomatic breadth, nasal breadth and total

facial height show less difference in variability when compared with the variability of the Ashanti than do our male Whites in comparison with the variability of the Old Americans. Once more we come up against the striking fact that our Negro hybrids are more stable in certain features than are our Whites and these stable features are all of Negro origin.

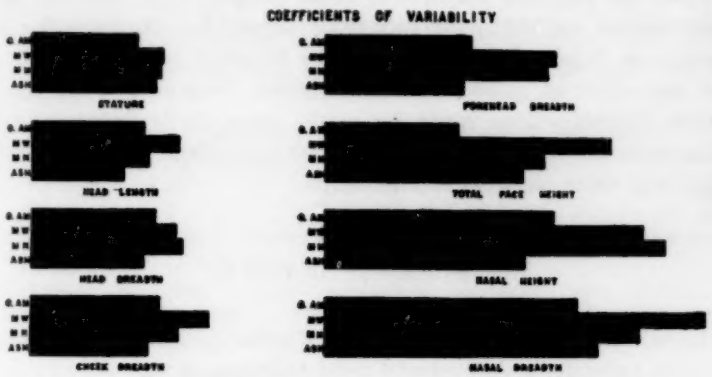

FIG. 4. SCALE DIAGRAM OF COMPARATIVE VARIABILITIES

O.Am. Hrdlička's male Old Americans. *ASH.* Rattray's male Ashanti. *M.W.* Western Reserve standard male White series. *M.N.* Western Reserve standard male Negro series.

CONCLUSIONS

By quantitative determination, by the study of variability, by the comparison of samples differing in their hybridization and by comparison with samples of undoubtedly purer Stock, we have been forced to the conclusion that, in our Negro hybrids, some features are more stable or more firmly entrenched than others and that these features are mostly to be found in the face.

Shall we conclude that this is a result of differential stability of hereditary pattern or are we to assume that increasing homogeneity (see 3) of our Negroes is bringing about this stability of African form? Both factors may be at work. But since traits cannot again be imprinted in a Stock from which they have been once expunged, the features in question must belong to the hereditary pattern. This interpretation is not at all at variance with Herskovits' evidence of increasing Negro homogeneity by his demonstration that there is less variability in family strains than within the families themselves.

The elimination of dark females and of light males from reproduction as the result of social conditions merely throws responsibility for entrenched features more upon the male than the female.

Fascinating as our theme may be, we must await more data before it can be followed up more satisfactorily. The most urgently necessary of all anthropological work is the accumulation of satisfactory data upon the physical features of those peoples who, however mixed in their origins, are still relatively little altered by interbreeding with other human Stocks. It is unnecessary to point to the undoubtedly mixed ancestry of modern West African Negroes. Nevertheless adequate investigations must be made upon them before the fast growing commerce and facilities for transportation have more hopelessly mixed their physical relationships.

APPENDIX ON DIMENSIONS

The field worker can rest assured that number of traits for measurement may be strictly limited and need not include any which may be embarrassing to obtain. The following is the list suggested by these investigations for the comparison of White and Negro stocks. It is not a guide to the series of time-honored measurements justified by convention rather than by usefulness. The numbers refer to the definition of measurement in Martin's *Lehrbuch*.

1. Stature. Stem length (not sitting height). 12. Height of iliac crest from floor. 45. Arm length from acromiale to dactylion. 40. Pelvic intercristal breadth. Chest breadth, depth and circumference in respiratory position of rest at level of ensiform cartilage. Facial measurements.

The respiratory position of rest is the attitude of chest most comfortable to the patient during the exhalation of a deep breath.

The facial measurements comprise: XVII. Total facial height (trichion-gnathion). XX. Upper face length (nasion-prosthion). XXI. Nasal height. XXV. Interlabral height. XXII. Nasal depth. XIII. Lower-nasal breadth. IX. Interocular breadth. XI. Breadth of palpebral fissure. XII. Interpupillary distance. XIV. Mouth breadth. XXIX. Maximum ear length. XXXII. True ear breadth.

If desired a few other measurements can be included, namely: 47. Upper arm length. 48. Forearm length. 49. Hand length. 52. Hand breadth. 58. Foot length. 59. Foot breadth.

SUMMARY

1. A careful analysis of White and Negro dimensions and their variabilities, supported by the comparison of samples differing in purity of origin and of present hybridization, gives clear indication of hereditary pattern in which some features are more stable than others. These features, mostly found in the face, are termed entrenched characters.

2. The selection of physical traits for measurement should be made with a clear understanding of the purpose for which the data are wanted.

3. Much more comprehensive investigation is necessary before a complete statement of entrenched characters is possible.

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DO RACES DIFFER IN MENTAL CAPACITY?

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STATEMENT OF THE PROBLEM

As everybody knows, the world is inhabited by people of different races. Thus we have the Europeans, the negroes, the Mongolians, the American Indians and others. These races differ by obvious physical characters. Nobody denies that the negro has a blacker skin than the European and that the nose is typically broader; that the distance between the eyes is typically greater; that the hair makes a closer curl. Nobody denies that the Southern Chinese have relatively shorter legs than the Nilotic negroes. It is perfectly obvious that the Scotch Highlanders are tall people, as compared with the Akkas of the Congo Free State. In their morphological differences, then, the different races of mankind have all of the different characteristics of different races of dogs.

In dogs, however, races differ not only in form and color but also in their instincts—in the ease with which they can be trained to do particular things. Thus the fox terrier is easily trained to catch rats, the collie to herd sheep, the pointer to flush game, the blood hound to follow trails, and so on. The differences in behavior of these races of dogs are not determined solely by their training but, rather, by a training adapted to a special and distinctive mental and temperamental makeup in each race that makes it easy to train one race to do a particular thing and another race to do another thing. There is a constitutional, hereditary difference in mental capacity between the different races of dogs.

When it comes to man, however, a hereditary difference in capacity for being trained in a given direction has been insufficiently demonstrated. To the ordinary observer the typical North American Indian, as compared with the European, seems reserved and taciturn and the typical negro seems light hearted and given to singing and music. But, first we are apt to be deceived by general impressions and,

secondly, even tho this difference exists, there is no evidence that it is anything but a consequence of the different environmental conditions under which the different races have been reared.

This lacuna in our knowledge has been emphasized by many students of mankind and some of them have, as it were, challenged the anthropologists to demonstrate a difference. Among those who have stressed this lacuna in our knowledge has been Dr. Franz Boas, the eminent professor of anthropology at Columbia University. Dr. Ernst Rodenwaldt, who has lately published his extensive study of the Mestizen of Kisar, also emphasizes the lack of evidence of any difference in mental capacity between the Malayans and Europeans. Science is indebted to these anthropologists for insisting on the necessity of more satisfactory evidence of difference in mental capacity in the different races of mankind before drawing wide, sweeping conclusions, based upon such assumed differences.

One reason why we are satisfied with the evidence for physical differences and dissatisfied with the evidence for mental differences in the races of mankind is that the differences of the first kind can be and have been precisely measured, whereas in the latter case the differences have not been satisfactorily, or extensively, measured. Not until we can replace opinion by accurate measurement with reliable tools can we demonstrate a difference. We are uncertain as to the existence of differences in mental capacity in the various races because we have not, hitherto, applied a satisfactory method of measurement.

The foregoing conclusion must, however, be qualified. Not a few attempts have been made to measure mental differences. A series of measurements has been made of negroes, as compared with white children, in the United States, by Mayo and others, and similar attempts have been made by Garth and others to measure the differences between Indian and European children. During the World War extensive psychological measuring was done on negroes and whites including the various sub-races of Europe. Differences, statistically significant, were, indeed, found, but the results have not been universally accepted. It has been alleged that tho the tests were uniformly applied yet they were not equally fair to persons of different culture, Thus, tho some of the tests were somewhat independent of language. yet none of them was completely so and consequently recruits born in non-English speaking countries were at a disadvantage in meeting the tests with those whose native tongue was English. This criti-

cism, of course, did not apply to the comparison of negroes and whites, but it was pointed out that the school education and early training of the negroes, as a group, were different from those of whites, as a group; again rendering the results incomparable. As for the test of Indian children it has been pointed out that where the test is a non-language one, where it is of the nature of a performance test, there speed has usually been an element in success and that speed is largely a result of training. The European child is brought up in an atmosphere of activity. His games are such as place a premium upon swiftness and deftness, whereas the Indian child is brought up under quieter surroundings and stealth is more esteemed than swiftness.

METHODS

In view of the unsatisfactory nature of mental tests, hitherto made, on different races it seemed desirable to try a new set of measurements on better selected material and these measurements were made during the course of two years recently in connection with comparative studies of negroes and whites in the island of Jamaica, B. W. I. First of all, it was necessary to select representatives of the two races living as nearly as possible under similar environmental conditions, and so there were selected primarily agriculturalists. Of these there was no lack among the negroes. The white agriculturalists, on the other hand, are relatively rare. However, we were able to find in Seaford Town a group of unmixed whites, chiefly of German origin, who had lived as a rural community for some four generations in that place. They were brought here at the beginning of the last century from Hamburg. In order to get sufficient numbers a study was made also of whites in the island of Grand Cayman. These are partly agriculturalists and partly fishermen. They are the descendants of British buccaneers. The negroes were drawn largely from such communities as Gordon Town and numerous other villages remote from Kingston, but a smaller number of students in teachers' training schools were included. The conditions of education were much alike for the blacks and whites. In fact there were more fairly well educated people among the blacks than among the whites. The data were collected by Dr. Morris Steggerda, upon whose industry and carefulness their value depends.

Some fifty to eighty adult persons from each of the two racial groups were studied. In one or two of the tests this number was considerably reduced for the whites, as will be indicated in the results.

In addition to the adults there were measured some fifty to one hundred children of each color, ages ten to thirteen years, and the results obtained from these children were tabulated separately. The language of the persons tested was English in all cases. There is no great difference between the groups in respect to age or other recognizable environmental conditions. There were employed about a dozen mental tests, for the most part independent of language. These are described below. As each test was applied to a group of persons it was found that the scores given varied from 0, indicating complete inability to meet the test, to 100, indicating a perfect ability. It is by comparison of the distributions of the different scores among the different races that we hope to reach an answer to the question: Do races differ in mental capacity?

RESULTS

Modern statistical studies have shown that in the midst of great variation in the expression of a given trait in a group of individuals there is a law which may be called the law of normal variation. The law is, in brief, this, that in the total range of variation of the trait there will be in the central part of the range a commonest or modal condition, but as we pass from the modal expression of the trait toward those classes in which the trait is less well expressed and those classes in which it is better expressed than the average the frequency of these classes diminishes as we depart from the central class. The frequency of the abmodal classes in the positive or negative direction is roughly proportional to the extent of the departure from the mode. Thus, if we express graphically the relative frequency of the different classes, starting from the lowest class and proceeding to the highest, the graph shows a tent-like form, the peak of the tent corresponding to the modal class.

Now some well known physical measures tend, commonly, to follow this law of distribution of frequencies. This finding is expressed graphically in Figure 1, which shows the percentage occurrence of the ratio of the length of the lower arm to the length of the total arm, including hand, in adult female negroes, mulattoes and white persons from the island of Jamaica. The distribution of the whites is shown by the fine line. The characteristic tent-like shape is obvious. The distribution of the ratio among the negroes is shown by the solid heavy line, which again reveals the tent-like form. The distribution among the mulattoes is indicated by the dash line, and this seems to be very

close to that of the negroes. It appears, however, that while the modes of the blacks and the mulattoes coincide at the point where the ratio of lower arm to total arm is 32 to 33 per cent, in the case of the whites the mode is in the next lower class, in which the ratio is

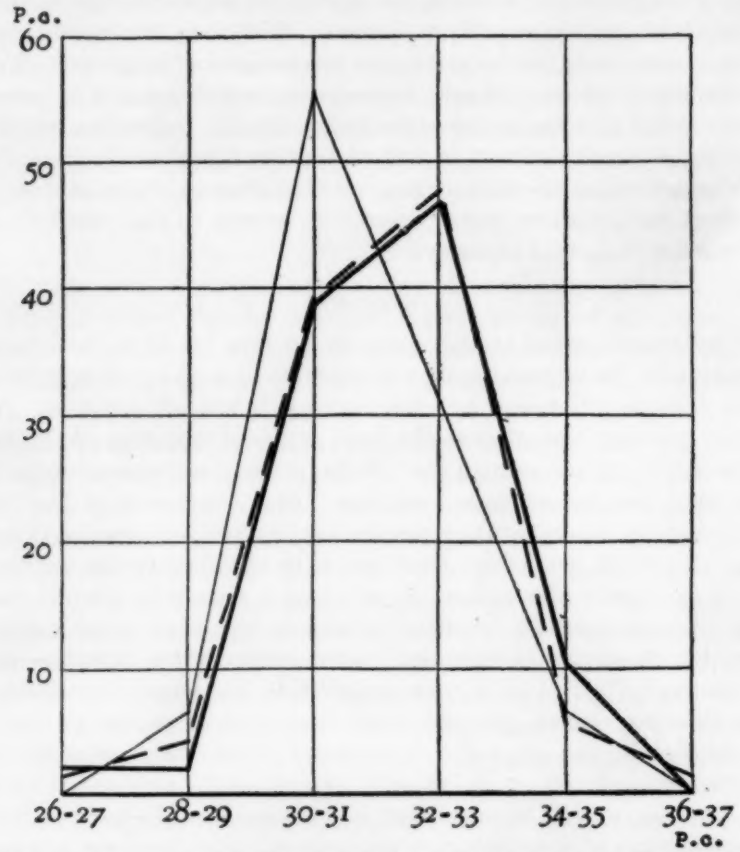

FIG. 1. PERCENTAGE DISTRIBUTION OF RATIO OF LOWER ARM LENGTH TO GROSS ARM LENGTH IN BLACKS (HEAVY LINE), BROWNS (BROKEN LINE) AND WHITES (LIGHT LINE) OF JAMAICA. FEMALES

30 to 31 per cent. Figure 1 thus shows that the proportional lower arm follows in its variation an approximately normal type of distribution, but that the distribution is different in whites and negroes; that the commonest condition among the whites is that in which the lower arm constitutes a relatively smaller part of the whole arm, while in

the blacks and negroes the lower arm constitutes a longer part of the total arm length. The distribution curves reveal also another fact, and that is that relatively more individuals are aggregrated at the mode in the case of the whites than in the case of the blacks. That is to say, the white population studied tends to have a larger proportion of those individuals massed at its commonest condition than have the blacks. We may say that the whites are less variable than the negroes in respect to the proportional length of the lower arm. Thus we are able to draw the conclusion that there is a difference in the physical trait of proportional lower arm length between the whites and the blacks, and we can say that this lower arm length is shorter in one race than in the other and is less variable.

We now take up, in turn, a series of tests of sensory and intellectual capacities of the two groups of the whites and negroes in order to see in how far they show the normal law of distribution of variations and in how far the average condition differs in the two races, both in respect to the location of the central, or modal, point and in respect to variability.

In the study of differences in mental capacity of races we turn, first, to ability to discriminate different time intervals in music, as measured by the Seashore test.

The Seashore test of time discrimination consists of a series of three notes, sounded from a victrola record, in which the interval between the second and third is slightly different from the interval between the first and second notes. Sometimes the second interval is longer, sometimes shorter, than the first. Sometimes the difference is obvious to any person of normal hearing, sometimes so slight that it can be detected only by those with a good ear for the differences in time interval.

The studies of Professor Seashore and many others made upon the same person at different ages and upon persons before and after extensive musical training show that the tests are tests of inborn capacity, probably dependent upon the anatomical structure of the ear and are, within normal limits, only slightly dependent on training. Therefore, in testing sensory abilities by the Seashore test we are really measuring psychological differences of natural capacity.

The results of this testing for time discrimination are revealed in Figure 2, in which are shown the results of measuring children and adults, the sexes being combined. The children are represented by the broken lines; the adults by the continuous lines. The findings from

whites are indicated by fine lines; those from pure blooded negroes, or blacks, by heavy lines.

A study of Figure 2 reveals at once that the distributions of the varying capacities for time discrimination follow the tent-like form

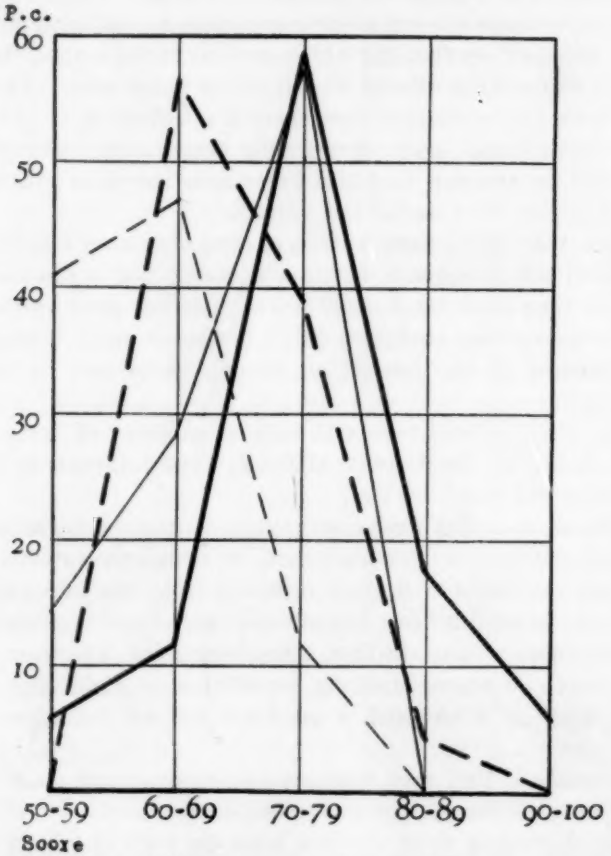

FIG. 2. PERCENTAGE DISTRIBUTION OF SCORES ATTAINED IN THE SEASHORE TIME DISCRIMINATION TEST BY 10–13 YEAR OLD CHILDREN (BROKEN LINE) AND ADULTS (CONTINUOUS LINE), BOTH BLACKS (HEAVY LINE) AND WHITES (FINE LINE). SEXES COMBINED

that we found in the case of proportional lower arm length. Figure 2 shows that the children, both white and black, most commonly respond correctly to between 60 and 69 per cent of the tests. Adults, on the other hand, respond correctly most commonly to between 70 and 79

per cent of the tests. This suggests that the capacity for time discrimination undergoes a development from 10 years to 25. It may be that experience plays a slight rôle in the improved mode of the adults over the youngsters; or the time-discriminating apparatus may be slow in developing.

As we compare the capacity for time discrimination in the adults we find that the modes for whites and blacks coincide. In both whites and blacks more persons make between 70 and 79 per cent correct discriminations than any other class of discriminations. A further study of the figure, however, shows that whereas no white adult gets a score as high as 80 per cent right, 17.5 per cent of the blacks do get so high a score. Indeed, 6 per cent of them get a practically perfect score and are able to make the finest of discriminations. Studying further these curves of the adult we find that 15 per cent of the whites get a score of between 50 and 59 per cent, which is practically a complete failure to make discriminations of time, because a deaf person or one who chose altogether at random would, by chance, get 50 per cent right responses. Similarly in the 60 to 69 per cent grade there are 28.5 per cent of the whites and only 11 per cent of the blacks who do so poorly. We see, then, that, on the average, the blacks make better discriminations of time than do the whites. If now we study the graphs of the children we get further light upon this capacity. Again the modes for white and black children of 10 to 13 years lie together and, in this case, as stated, at 60 to 69 per cent right responses. However, while none of the negro children make fewer than 60 per cent right responses, two-fifths of the white children fall into this low class, which means failure, and while nearly two-fifths of the negro children make from 70 to 79 per cent of the responses correctly, only 12 per cent of the white children get so high a score as this. We see, then, that among children as well as among adults the blacks make a better discrimination of time than do the whites.

It is necessary, then, to answer the question with which we started, as follows: There is a racial difference in capacity for discriminating minute time differences, and the negroes appear to be superior in this respect to the whites.

A second test of musical discrimination was made, following Seashore, in respect to rhythm. The results of the tests on rhythm are shown in Figure 3, both for adults (continuous lines) and children, 10 to 13 years of age (broken lines), sexes combined. Considering the distributions of score-frequencies generally it appears that they

form nearly typical tent-like curves. The crest of the tent for the white children is, however, at 60 to 69, while for black children it is at 70 to 79. This demonstrates that for the group studied the black children have a better sense of rhythm than white children.

The distribution for the adults is rather peculiar and remarkable. In the case of the whites the distribution is not so far from normal

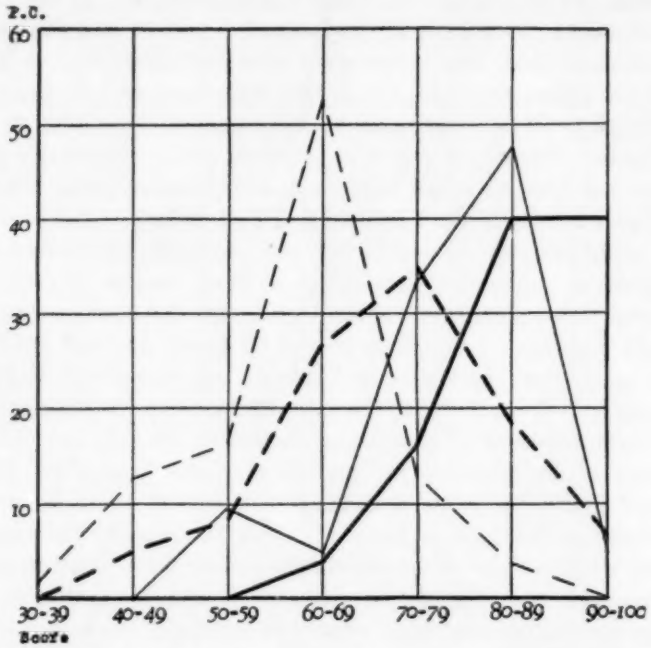

FIG. 3. PERCENTAGE DISTRIBUTION OF SCORES OBTAINED IN THE SEASHORE RHYTHM DISCRIMINATION TEST, BY 10–13 YEAR OLD CHILDREN AND BY ADULTS, WHITES AND BLACKS. SEE LEGEND OF FIG. 2

and the peak score is found at from 80 to 89. In the negroes, on the other hand, the peak is so close to a perfect sense of rhythm that the resulting curve is a half tent. Forty per cent of the black adults made a practically perfect score in sense of rhythm, whereas only 5 per cent of the whites did so.

These curves are quite demonstrative of the conclusion that the negroes, both children and adults, have a far better sense of rhythm than the whites of a corresponding age.

Rhythm probably depends upon some structural peculiarity of the hearing mechanism, and it seems probable that this mechanism is

superior in the blacks to the whites. The conclusion has, therefore, to be drawn that there is a racial difference in discrimination of capacity for rhythm between the negroes and the whites.

A test was made of the ability of the persons examined to copy three geometric figures, a circle, a conventional diamond and a square.

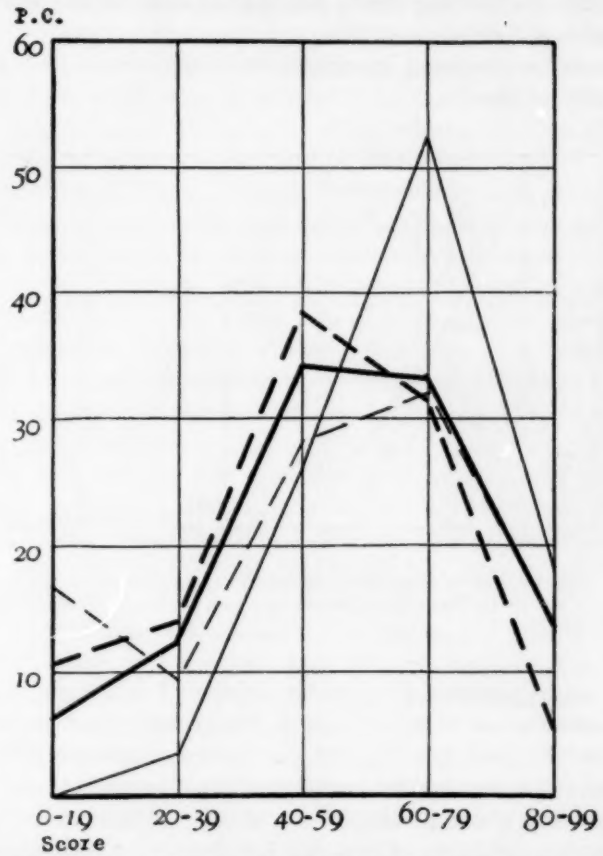

FIG. 4. PERCENTAGE DISTRIBUTION OF SCORES OBTAINED IN COPYING CERTAIN GEOMETRIC FIGURES, BY 10–13 YEAR OLD CHILDREN AND BY ADULTS, WHITES AND BLACKS. SEE LEGEND OF FIG. 2

The results are shown in Figure 4, both for children, 10 to 13 (broken lines) and adults (continuous lines), sexes combined. It appears that for the children the modal score of the whites is 60 to 79, whereas the modal score of the blacks is 40 to 59. Hence the white children do

better in copying the geometrical figures. There is a little irregularity in the curve for the white children in that it runs up in the 0 to 19 class. This is possibly due to insufficient numbers. Turning now to the adults we find again a tent-like distribution of which the modal score of the whites is at 60 to 79, while the modal score for the blacks is at 40 to 59. It is clear that a larger proportion of the adult blacks get poor scores than of the whites.

We have to conclude, therefore, that there is a real difference in the ability of the blacks and whites to copy the geometric figures.

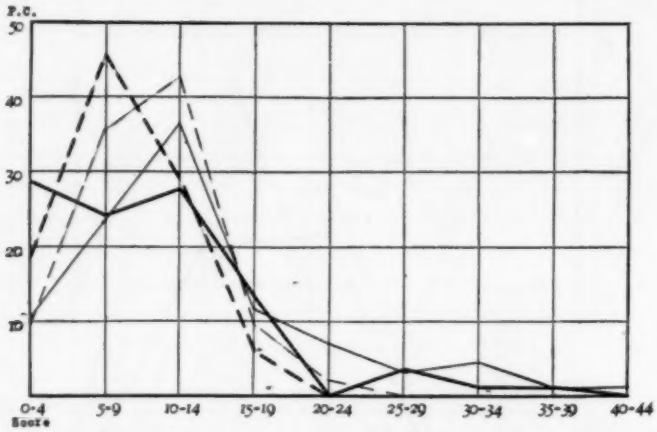

FIG. 5. PERCENTAGE DISTRIBUTION OF SCORES OBTAINED IN MAKING THE DRAWING OF A MAN, BY 10–13 YEAR OLD CHILDREN AND BY ADULTS, WHITES AND BLACKS. SEE LEGEND OF FIG. 2

This can not be accounted for on the ground of difference in training, since in Jamaica our white and black groups had equal facilities. In fact, as stated, there was slightly more school training given to the blacks measured by us than to the whites, inasmuch as some of the blacks were in a training school for teachers. The results suggest, at least, an innate difference in capacity for visualizing the forms that are being drawn, so that the image, held in the mind, shall be traced accurately.

A fourth test was made of the ability of the two color groups to make, offhand, without a model, a drawing of a man. The results of this test are shown in Figure 5, both for children, 10 to 13 years of age (broken line) and adults (continuous line), sexes combined. The darker lines are the results obtained from the blacks.

Comparing the results from the children we find that the modal score of the white children is 10 to 14, while the modal score of the black children is 5 to 9. The distributional curves of the two color groups are seen not to coincide at any point but always the black children shown an inferiority to the white children.

With the adults the results are slightly different. The modal score of the whites is at 10 to 14; that of the blacks lies either at 0 to 4 or at 10 to 14, or the theoretical mode may lie between these points. Twenty-nine per cent of the adult blacks fail completely in the drawing of a man, whereas only 10 per cent of the whites fail. In general, in the higher scores there are more whites than blacks.

The drawing of a man involves important mental processes. It involves some planning and organization of the proposed composition. It involves some ability to visualize that which is to be drawn; some ability to trace with the pencil the mental image. Closeness of observation and interest in the details of form come in to enable the person examined to reproduce details accurately. In these respects the white person seems better equipped than the blacks. There seems to be a racial difference in that innate capacity which is measured by the drawing of a man.

Another test applied was the ability to reconstruct a manikin from six pieces of wood, representing respectively the head, trunk, the two arms and the two legs. There were five pieces to put upon the trunk and each might be put on right or wrong. Errors, accordingly, ranged from 0 to 5.

The results of this test are shown in Figure 6. The distribution is a remarkable one. It does not show the ordinary tent-like distribution. There are, rather, two half-tent-like distributions that overlap. The curves are shown for adults only.

The commonest score of both whites and blacks is that of no mistakes. About 58 per cent of the whites make no mistakes and about 40 per cent of the blacks. If we pass to the classes containing one to three or more errors the numbers are much diminished as far as the class at three errors, but it is remarkable that 31 per cent of the blacks made all possible mistakes or failed completely and only 7.5 per cent of the whites failed so badly.

This test seems to measure ability to put parts together so as to reproduce one's mental image of a man. Those who were satisfied with placing the parts incorrectly must have visualized a man very hazily. They must have observed poorly how a man is put together,

or they were very uncritical of their own work. They all understood what was expected of them. All made an effort to put the parts together but many were easily satisfied with their work, even tho the fingers were directly attached to the arm-pit and the near end of the

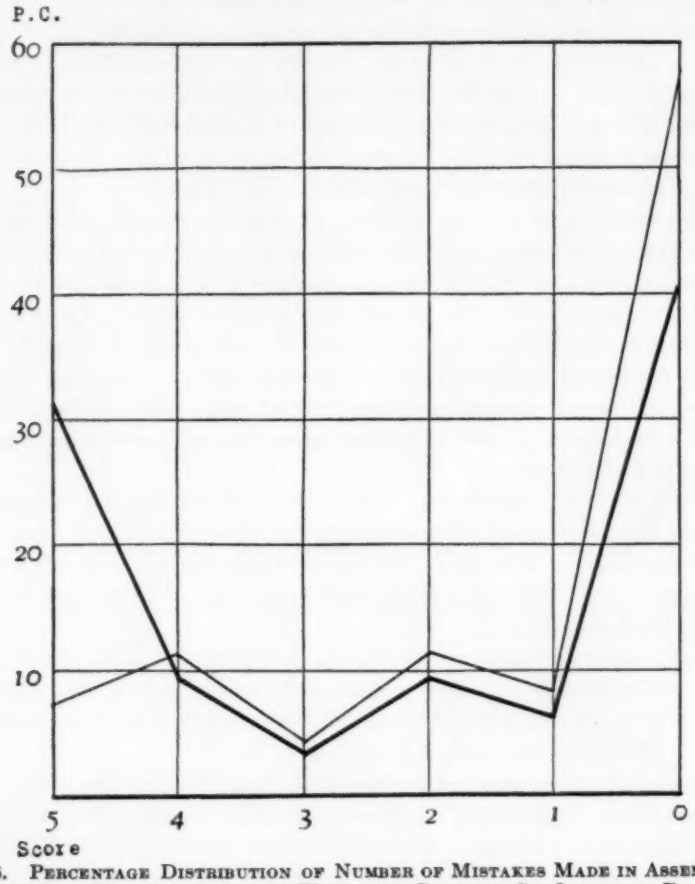

FIG. 6. PERCENTAGE DISTRIBUTION OF NUMBER OF MISTAKES MADE IN ASSEMBLING PARTS OF A MANIKIN, BY ADULTS, WHITES AND BLACKS. SEE LEGEND OF FIG. 2

arm stood out in space. The most of the whites were far more critical in this reconstruction and successful in attempts to put together the manikin in the best possible fashion.

The results in Figure 6, combined with Figure 5, would indicate that the errors of the blacks are due not merely to inability to draw but to inability to visualize properly and to judge the work done critically.

Still another test is that of the form-board, in which a piece of wood, having a mortised hole, is given to the subject, together with four small blocks, which he is told to fit into the hole. It is probable that this test was equally novel for all of the persons who tried it.

This form-board test (Knox moron test) was tried out only on adult blacks and whites and each person was given two trials. Figure 7 gives the results of these two trials. The tent-like distribution is clear. The mode is at 61 to 120 seconds in the case of both blacks and whites for both the first and second trials. However, there is a group comprising about 25 per cent of the blacks and about 8 per cent of the whites that fail to do the test in the four minutes allowed as a maximum. The double-peaked distribution indicates that both blacks and whites fall into a bright and a stupid class in respect to this test.

The graph also shows that to the most rapid class (under 61 seconds) there comes no increase of whites in the second test while the percentage of blacks in this class increases from 7 to 17. The blacks and whites both show improvement on the second trial; and the blacks improve, on the average, a little more than the whites. In general, the whites are markedly superior to the blacks in fitting blocks into a hole.

The superiority of the whites in the form board seems to indicate their superior ability to hold a mental image, which plays an important part in determining the result. Also ability to profit by experience certainly does. Every one who has tried the form board test out with feeble-minded children notes how repeatedly they make the same errors, so that they fail to accomplish the task simply thru the waste of time in futilely attempting to do the same impossible things over and over again. In ability to profit by such experience the average white seems superior to the average black person.

A seventh test was that of the ability to reconstruct in the mind the figure that would result when a twice folded paper was notched along the double fold. This cutting of a folded paper is the sort of thing we used to do in our childhood in order to make a chain of paper dolls clinging together by the hands. In the case in question a triangular notch was made. Clearly, on opening the last fold there would be a diamond shaped figure and when the first fold was opened there would be two diamond shaped figures, removed from each other by an inch or two. Four classes of answer were considered. If the correct response "2 diamonds" was given the person was graded "3;" if the response "1 diamond" was made it counted him as "2."

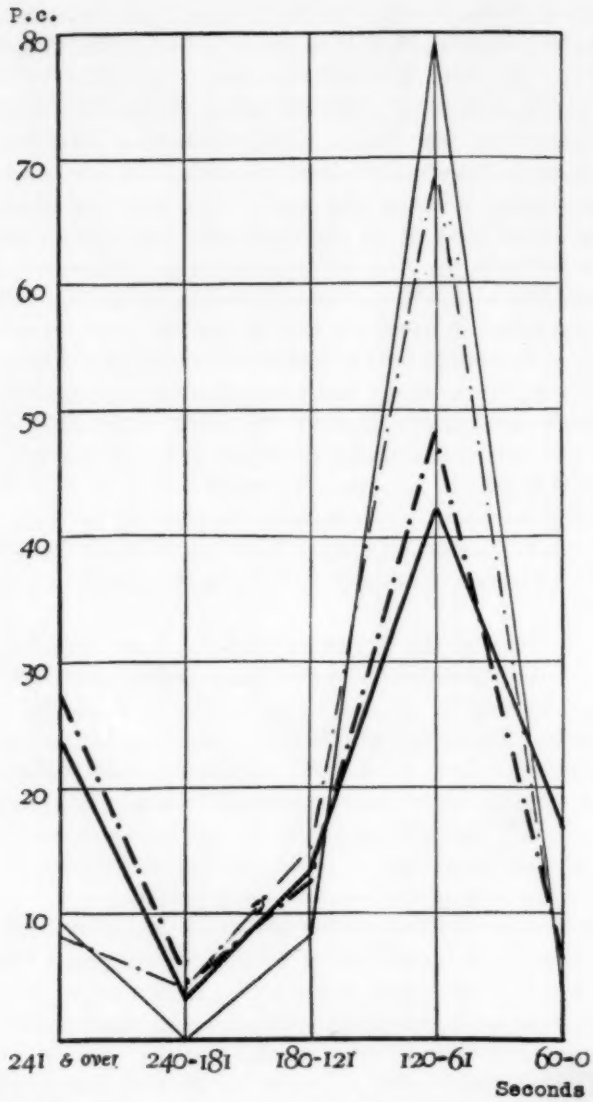

FIG. 7. PERCENTAGE DISTRIBUTION OF TIME TAKEN IN THE KNOX MORON TEST. THE DISTRIBUTIONS OF THE RESULTS OF THE FIRST TRIAL ARE GIVEN AS DOT AND DASH LINE; OF SECOND TRIAL AS CONTINUOUS LINE. BLACKS, HEAVY LINE; WHITES, LIGHT LINE. ADULTS ONLY

If "star" was the judgment the person tested was scored "1." Any other answer scored "0." Figure 8 shows the distribution of these different grades. The tent-like figures are seen centered about score "2"—the incorrect response "1 diamond." Eighty-three per cent of the juvenile blacks gave this response. Over 40 per cent of the adult whites and slightly under 40 per cent of the adult blacks

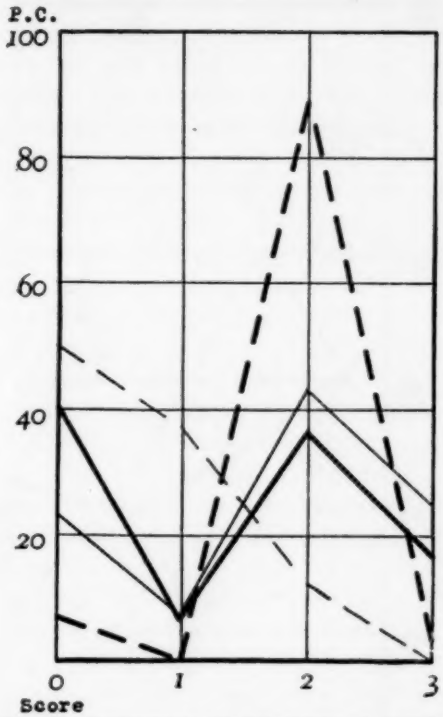

FIG. 8. PERCENTAGE DISTRIBUTION OF RESPONSES TO THE QUESTION CONCERNING THE NOTCHED FOLDED PAPER, BY 10–13 YEAR OLD CHILDREN (BROKEN LINES) AND BY ADULTS (CONTINUOUS LINES). BLACKS, HEAVY LINE; WHITES, LIGHT LINE

did so. The responses of the juvenile whites are very remarkable. None of them gave the correct response. Few of them visualized even a single diamond. Fifty per cent of them failed to give anything approximating a correct response. As between the adults we find 22.5 per cent of the whites gave the correct response and 18.5 per cent of the blacks. So far as the adults go the whites seem clearly superior to the blacks, but the juvenile blacks were quicker in their response and, altho none of them was correct, none of them gave a favorite

response of the whites, namely, a "star." They seemed to concentrate on the response "one diamond" which indicated a limitation to their mental vision. The superiority of the black children over the white children thus suggests, what many of our results indicate, that the black children are more precocious than the whites.

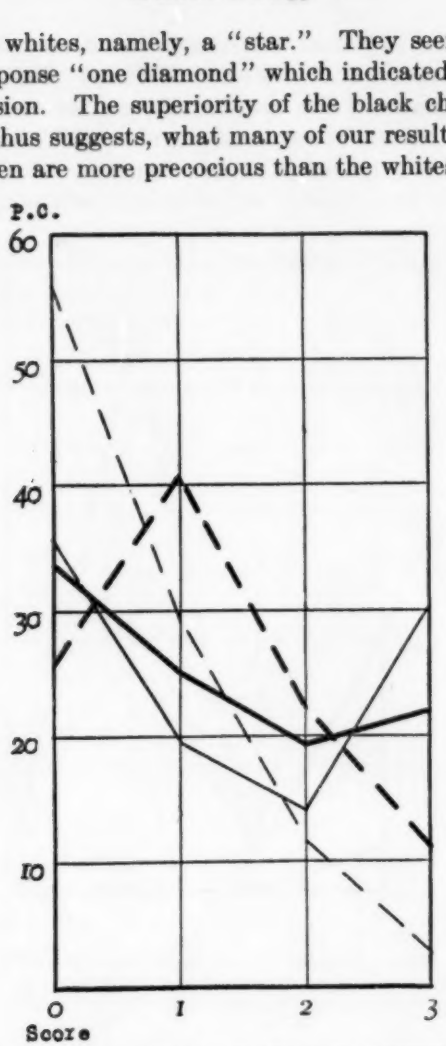

FIG. 9. PERCENTAGE DISTRIBUTION OF CORRECT REPETITIONS OF 3 SERIES OF 7 FIGURES EACH, BY 10–13 YEAR OLD CHILDREN AND BY ADULTS. SEE LEGEND OF FIG. 2

Still another test applied was the ability to repeat a series of seven figures in the exact order in which they were given. For example, the series might be 3, 9, 7, 5, 6, 8, 1. The results both for children (broken lines) and adults (entire lines) are given in Figure 9. There are only three of these sets of figures with seven in a set and, hence, the scores

were either 0, 1, 2 or 3 correct. The distributions, as shown in Figure 9, are very peculiar. The tent-like distribution is shown only with the juvenile blacks, whose peak, or mode, is 1 correct. In this test, as in the test with the folded paper, the juvenile whites do much the worst of any of the groups. Fifty-six per cent of them failed to repeat any of the series and only 3 per cent did them all correctly. The consequence is that the distribution of grades for the white children is a sort of half distribution curve.

The distribution of the adult whites is still more remarkable. Instead of a tent-like figure we have a trough. This is because more of the adults performed the test perfectly, or failed entirely, than were successful in merely one or two of the series. It seems as tho the persons tested were, for the most part, either able to repeat all of the series correctly, or else none of them.

As for the adult blacks, we find by consulting Figure 9 that while 22 per cent of them gave a perfect response 30 per cent of the adult whites did so. However, more of the blacks than of the whites scored as much as 2 and still more scored 1. On the whole, however, the adult whites are slightly superior to the adult blacks. Remarkably enough it appears from our examination that the browns (whose scores are not given in Figure 9) graded significantly better than either the blacks or the whites. Repetition of a series of figures is, then, something in which the whites are not strikingly, if at all, superior to the blacks, while the adult mulattoes are slightly superior to either pure race.

There was tried, also, that one of the well-known Binet tests which requires the criticism of some absurd sentences, such as, "May you live to eat the chicken that scratches on your grave." There were five of these sentences given and the grades achieved run from 0 to 5; "5" indicating that the person examined properly interpreted the absurdity of all sentences.

The result, as shown in Figure 10, is exceedingly irregular. There is no obvious tent-like form of the score. It is, however, obvious that more of the adult whites criticised adequately the absurdities in the sentences than the adult blacks. Also, many more of the adult blacks failed to see the absurdity in any of the sentences than of the adult whites. On the other hand, there is no such clear distinction in the critical capacity of the juvenile members of the two color groups. We may say that the whites have, on the whole, a clearer insight into the absurdity of the test sentences, that they are more critical in their

attitude toward them, that the absurdity makes a stronger appeal to their logical sense. It seems probable that here, too, we are dealing with a native trait, which, however, develops only rather late, some years after adolescence.

Finally, the groups were given the Army Alpha examination, since they were all able to read. There were eight tests applied: 1, ability to carry out directions; 2, simple mental arithmetic; 3, common sense;

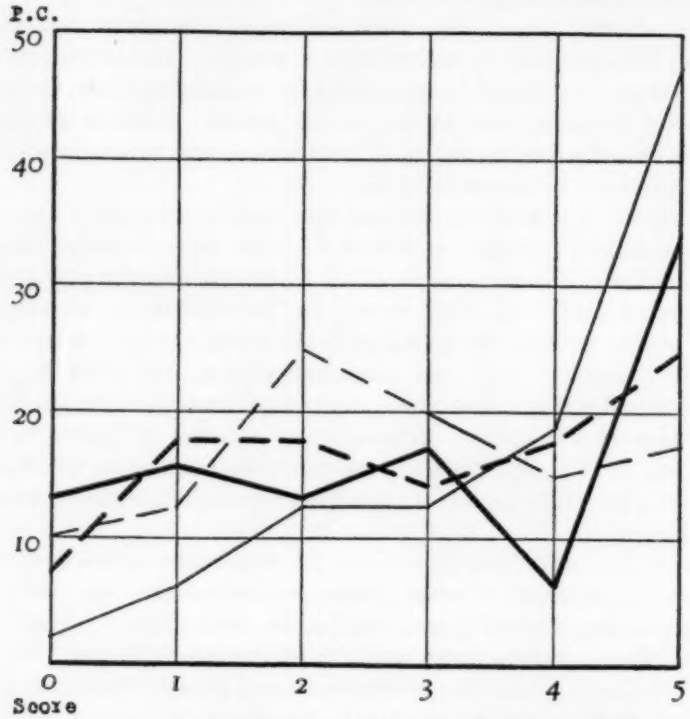

FIG. 10. PERCENTAGE DISTRIBUTION OF NUMBER OF CORRECT CRITICISMS OF 5 ABSURD SENTENCES, BY 10–13 YEAR OLD CHILDREN AND BY ADULTS. SEE FIG. 2

4, distinguishing synonyms and antonyms; 5, recognizing the truth or falsehood of pied sentences, after they have been reconstructed; 6, continuing a number series of which a start has been given; 7, seeing the essential relations of things; 8, choosing one of a number of given words that will make the truest sentence, a test of general information. Now in these eight tests there were four in which the whites were significantly superior to the blacks. These were the tests of common

sense, of distinguishing synonyms and antonyms, of recognizing truth or falsehood of reconstructed sentences, and of the choice of words to make the truest sentences. In the remaining four tests the blacks did slightly better than the whites but in none of them was the difference significant. While it is difficult to see just exactly what mental traits are measured by these tests it is clear that some of them involve imagery, organization, matter-of-factness and "common sense" and in these the whites appeared to be superior.

In conclusion it appears that, from a mental examination of fairly large samples of whites and negroes, living under as nearly as possible similar social and economic conditions and having about the same amount of scholastic training, there are certain clear differences in mental output. Some of these differences, like those of the Seashore test, have certainly to do with discriminations dependent upon anatomical structure. In other cases it is quite clear that difference in ability to form clear images is an important factor. Where the discrimination of the elements of music is involved the blacks, in general, do better than the whites; but where the ability to form clear cut images, to organize an operation, to see thru absurdities, to exercise common sense are involved, there the whites are superior to the blacks, at least in our series. The whites seem to be more matter of fact than the blacks and do better than the blacks in operations which involve good judgments. We do not know the anatomical, structural bases of these differences as well as we do those of the differences in musical discrimination, but there can be little doubt, I think, that they have such bases. We may conclude, therefore, that there are differences in the structure of the sense organs and the nervous system of negroes and whites, such that the negroes are superior in some respects, the whites in others. The conclusion that one may draw from these experiences is that there are differences in the sensory and intellectual fields between different races of mankind; and that they are of the same order as the long recognized physical differences between them.

COLD SPRING HARBOR, N. Y.
JULY 2, 1928

THE SEX FACTOR IN INFANT MORTALITY*

BY HARRY BAKWIN, M.D.

New York

Since the demonstration by Pasteur of the bacterial nature of infectious disease, attention has been focused almost exclusively on the environmental factor in the causation of disease. The fact that disease and death are resultants of several factors, both environmental and constitutional, has been to a large extent lost sight of, and variations in disease susceptibility and severity are attributed vaguely to the differences in the virulence of the infecting organism and the resistance of the individual.

A striking illustration of the importance of the constitutional factor in disease is brought out by the difference in the mortality of the sexes during infancy. Such differences occur at all ages. They are of particular interest during infancy, since at this time of life the environment for the sexes is uniform and consequently variations in mortality rate may be safely attributed to the difference in the action of the environment on the individual.

During the 10 year period from 1915 to 1924 inclusive, there were from 130 to 134 deaths in white male infants under one year from all causes to 100 deaths in white female infants under one year, in the United States registration area. Since the proportion of males to females at birth during that period was approximately 106 to 100, it is apparent that the death rate in boys is considerably higher than that of girls during the first year of life.

The higher mortality of male infants has been a subject of interest for a great many years. In a paper read before the Royal Society of London in 1786, Dr. Joseph Clarke, a Dublin physician,[1] pointed out

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Read before the Pediatric Section, New York Academy of Medicine, March 8, 1928.

[1] Clarke, J. Observations on some causes of the excess of mortality of males above that of females. *Phil. Trans. Roy. Soc.*, London, 16: 122, 1786.

that the mortality of males exceeds that of females in almost all stages of life and especially in the earliest. His observations, made before mortality statistics were accurately collected in England, were based on a register kept by one of the under clerks of the House of Commons and on his own large hospital statistics. From his observations he concluded that "human life in males is more brittle than in females only in consequence of adventitious causes or of some particular debility which takes place in polished and luxurious societies and especially in great towns". He pointed out that since male fetuses grow to greater size than females, there would be greater hardship at the time of birth and much less chance of saving a boy at a difficult labor than a girl. Also the effect of injury might not be immediate but might be sufficient to weaken the male constitution and so render it more apt to develop disease and less able to struggle against it. Another factor contributing to the greater mortality among males was the fact that, since male fetuses were naturally constituted to grow to larger size than the female, a greater supply of nutriment was necessary for their growth. Any defect in the mother, therefore, would be more injurious to the male. And though the male children might escape abortion or injury at birth they would be more apt to languish under disease or die at some future period because of their originally half-starved frame.

Clarke proceeded to make measurements of the weight and head size of newborns to verify some of his statements. His measurements were among the first accurate determinations of weight at birth, it having been taught before his time that the newborn weighed regularly from 12 to 16 pounds.

DISEASE MORBIDITY

There are few accurate data regarding predisposition of the sexes toward disease during infancy, since large groups of morbidity statistics are difficult to obtain. Of 2667 sick infants under 2 years admitted to the Children's Medical Division at Bellevue Hospital from 1923 to 1927 inclusive, there were 1424 boys and 1243 girls, i.e. 115 males to 100 females.

There are few conditions in infancy in which predisposition on the part of one or the other sex is marked, e.g. pyloric stenosis, vomiting, colic, and intussusception in boys, and pyelitis in girls. Less well known is the higher incidence among males of infantile

tetany[2,3] and congenital laryngeal stridor.[4] Diphtheria is also more common among male infants than among female.[5] Pertussis, on the other hand is commoner in girls.[6]

THE SEX RATIO IN STILL-BORN MORTALITY

Schultz, in a study of over 1400 embryos, great care being taken to determine age and sex,[7] found marked variations in the sex ratio of still-births from month to month (Table 1). During the third and

TABLE 1

The Sex Ratio by Months of Age of 1410 *Fetuses from Different Months. (From Schultz)*

AGE IN MONTHS	SEX RATIO	
	Total Material	Whites Only
3rd	121.0	110.7
4th	117.5	122.0
5th	109.6	107.0
6th	87.5	88.4
7th	108.5	112.1
8th	133.3	123.5
9–10th	167.6	156.5

fourth months of gestation the ratio is high (121, 117.5). In the fifth to seventh months it declines markedly (to 101.9), rising again in the eighth to tenth months to a much higher figure than in any previous period (167.5 for the total material). It is interesting to note that the number of pathological fetuses in the series was about the same for both sexes. According to Schultz's calculations from 108 to 109 males are conceived for every 100 females.

[2] Howard, C. P. Tetany: A report of nine cases. *Am. J. M. Sc.*, 131: 301, 1906.

[3] Bakwin, H., and Bakwin, R. M. Sex factor in infantile tetany. *Am. J. Dis. Child.* 35: 964, 1928.

[4] Thomson, St. Clair. Diseases of Nose and Throat, 3rd Edition, New York, 1926, p. 503.

[5] Crum, F. S. A statistical study of diphtheria. *Am. J. Pub. Health*, 7: 445 (Mar.), 1917.

[6] Crum, F. S. A statistical study of whooping cough. *Am. J. Pub. Health*, 5: 994, 1915.

[7] Schultz, A. H. Sex Incidence in Abortions. Publication 275, Carnegie Institution, Oct. 1921.

VARIATIONS IN THE MORTALITY SEX RATIO DURING THE FIRST YEAR OF LIFE

In Chart 1 is illustrated the sex ratio during the first two months of life in certain subdivisions of age (first day, second day, third day, fourth to seventh days, second week, etc.) for the U. S. Birth Registration Area (continuous line), and for New York State (dotted line). During the first two days of life the ratio is high (140). It rises sharply on the third day of life to 147 and then falls rapidly, reaching its lowest point during the third week. It then rises again reaching another peak in the second month, after which it declines gradually as shown in Chart 2.

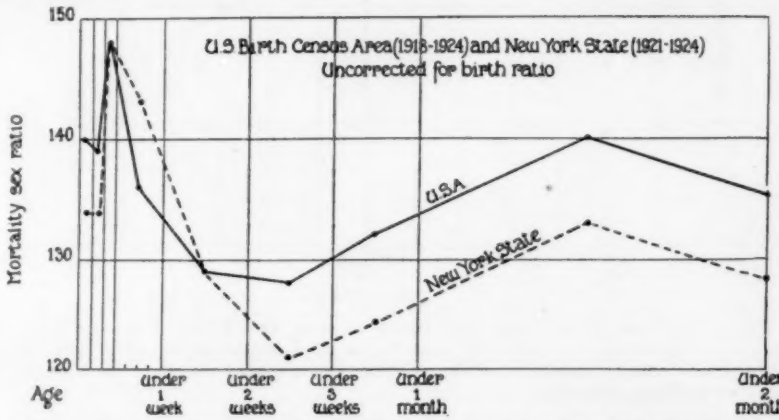

CHART 1. THE MORTALITY SEX RATIO DURING THE FIRST TWO MONTHS OF LIFE. Age is represented along the horizontal axis, the sex ratio along the vertical axis. (Data obtained from U. S. Birth, Stillbirth, and Infant Mortality Statistics 1918–1924 inclusive, white infants only.) Sharp rise in ratio on the third day of life, followed by rapid fall until the third week, after which the curve starts to rise again.

A curve for the sex ratio during the first year of life by larger subdivisions of age is illustrated in Chart 2. As stated above the ratio is high during the first month. There is a rise during the second month of life, after which the ratio declines gradually. The rise in the mortality sex ratio during the second month of life has been noted by Holmes[8] and by Stevenson.[9]

That the decrease in the mortality sex ratio as age increases is due to a decrease in the susceptibility of the male and not to the presence of

[8] Holmes, S. J. Sex ratio in infant mortality. *Univ. Calif. Publications in Zoology*, 29: 267, 1926.

[9] Stevenson, T. H. C., quoted by Holmes.[8]

certain conditions in early infancy with high mortality sex ratios and to their absence in later infancy is shown when the ratios for the various groups of diseases, e.g. pneumonia (all forms), diarrheal

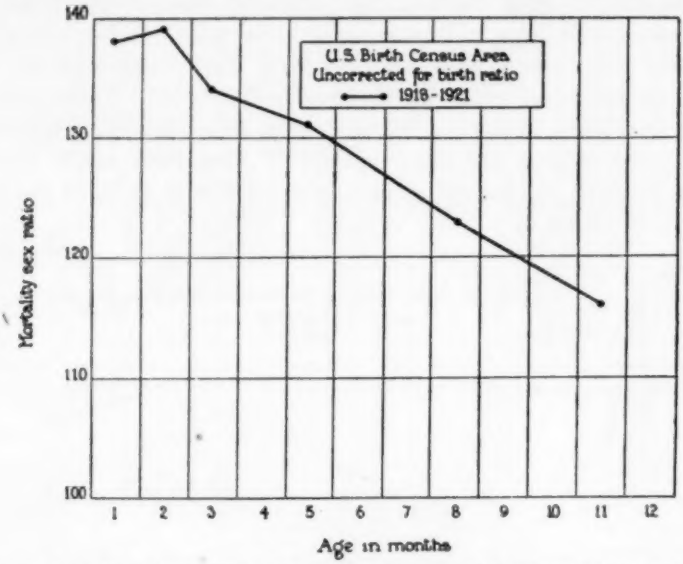

CHART 2. THE MORTALITY SEX RATIO DURING THE FIRST YEAR OF LIFE IN CERTAIN SUBDIVISIONS OF AGE. (United States Birth Registration, 1918–1921, white infants only.) Slight rise in mortality sex ratio during second month of life after which the curve declines gradually.

TABLE 2

The Mortality Sex Ratios for Various Diseases at Certain Subdivisions of Age (U. S. Birth Registration Area, White Infants, 1916–1921)

CAUSE OF DEATH	AGE—MORTALITY SEX RATIO					
	1st month	2nd month	3rd month	4–6 month	7–9 month	10–12 month
Diarrheal diseases	138	141	136	127	122	120
Pneumonia—all forms	139	139	138	139	128	118
Congenital debility, etc.	139	148	139	127	118	104

diseases, congenital debility, are compared at various age subdivisions of the first year (Table 2). The sex ratios for all groups of diseases are high in the early months and low in the later months.

VARIATIONS IN THE MORTALITY SEX RATIO DURING THE FIRST FIVE YEARS OF LIFE

In Chart 3, curves for the mortality sex ratio in England and Wales are shown for the first five years of life. For purposes of comparison, curves have been constructed for 1900, 1910, and 1926. The sex ratio

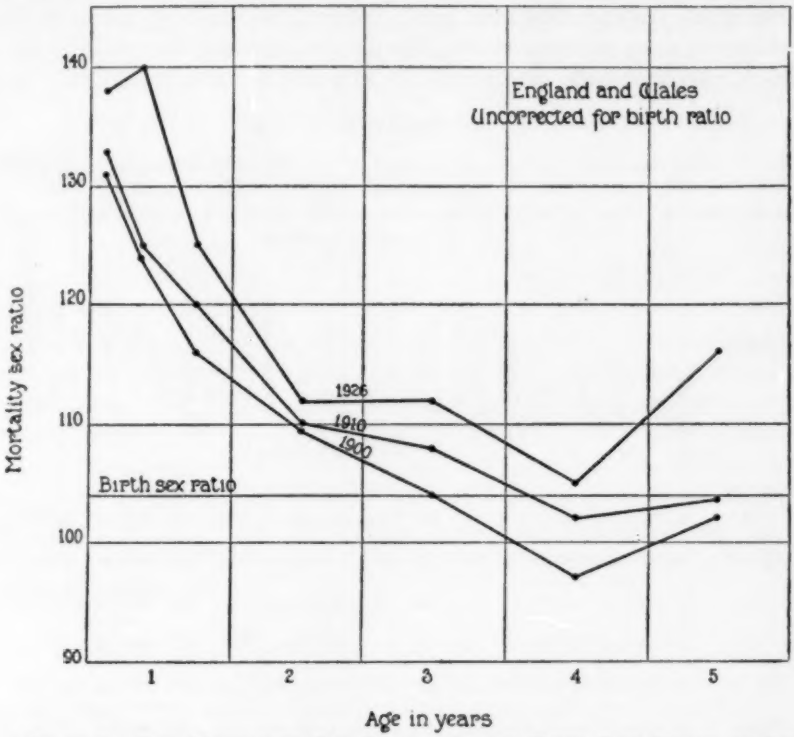

CHART 3. THE MORTALITY SEX RATIO FOR THE FIRST FIVE YEARS OF LIFE (ENGLAND AND WALES). The ratio declines steadily until the fourth year, after which it rises.

decreases regularly from infancy until the fourth year. There is a slight increase in the fifth year. In 1900 and 1910 the death rate during the fourth year was higher among girls than among boys. In 1926, however, the death rate among males was higher. Though, as will be shown later, the reduction in the infant death rate has been greater for females than for males, as evidenced by a rising sex ratio with the years, the reversal since 1921 of the mortality sex ratio in the fourth year, at which age in former years girls were more susceptible,

indicates that the males which are now being saved are frailer than the females.

THE MORTALITY SEX RATIO FOR VARIOUS DISEASES

In Table 3 mortality sex ratios for some of the commoner causes of death during the first year of life are shown for the U. S. Registration Area, from 1915 to 1924 inclusive. Correction has been made for the sex discrepancy at birth so that the figures represent the ratio of male death rate to female death rate. Calculations have been made only

TABLE 3

The Mortality Sex Ratio for Various Diseases, U. S. Mortality Statistics (1915–1924), *white infants only*

YEAR	DEATH RATE	CAUSE OF DEATH																	
		All Causes	Measles	Pertussis	Diphtheria	Erysipelas	Meningitis non-tuberculous	Tuberculosis all forms	Tuberculosis respiratory	Tuberculous meningitis	Syphilis	Convulsions	Pneumonia all forms	Diarrheal diseases	Intestinal obstruction	Malformations	Congenital debility, etc.	Premature Birth	Birth Injury
		Mortality Sex Ratio																	
1915	99	131	131	95	121	114	147	124	126	122	124	141	131	125	152	139	134	129	167
1916	99	130	125	92	126	116	147	132	130	124	132	132	132	126	157	129	139	131	161
1917	91	132	118	94	117	107	138	129	143	120	129	152	136	129	168	136	133	132	162
1918	97	131	124	93	149	104	133	124	132	116	132	147	132	127	154	133	140	134	161
1919	83	132	129	94	128	119	151	127	126	124	137	153	132	127	170	130	140	132	161
1920	82	133	117	96	152	103	122	127	143	116	139	148	134	131	185	133	148	131	152
1921	72	133	134	90	143	123	149	115	111	114	133	139	135	129	151	132	141	132	166
1922	73	134	121	90	138	99	150	118	118	115	118	140	140	131	169	135	144	131	165
1923	73	132	123	93	144	99	140	122	124	120	145	135	131	131	183	131	139	129	159
1924	67	134	129	93	142	103	136	126	140	115	127	159	132	135	192	133	143	129	164
Average.....	82	132	125	93	136	118	141	124	129	118	131	145	134	129	168	133	140	131	162
Ratio Male Death Rate to Female Death Rate		125	118	88	129	112	133	118	122	112	124	138	126	122	159	125	132	123	153

for white infants. It will be seen that, excepting in pertussis and erysipelas, the mortality among male infants is regularly higher than among females. The highest sex ratios are found under the heading of intestinal obstruction (159). The ratio for birth injury is also very high, averaging 153. The sex ratios for infantile convulsions (138), non-tuberculous meningitis (133), and abdominal tuberculosis (Holmes[8]) are also well above the average of death from all causes.

The mortality sex ratios for the most common causes of death in infancy, congenital debility (132), malformations (125), pneumonia (126), prematurity (123), and diarrheal diseases (122) are fairly close together.

Pertussis is definitely more common as a cause of death among females than among males. The only other disease with a low mortality sex ratio is erysipelas. In the table of sex ratios prepared from the U. S. Mortality Statistics for a 24 year period (1900–1923), by Holmes,[8] the ratio of deaths from erysipelas under one year, corrected for the sex discrepancy at birth, is 95.5, indicating a slightly greater susceptibility of females. This figure is of particular interest, since the sex ratios for all other causes of death, excepting pertussis, are well above this. Holmes points out what appears to be a contradiction in the case of the mortality sex ratio for erysipelas. Whereas the ratio in young infants is fairly high (132 under one month, U. S. Birth Registration, 1916–1923, Holmes), indicating a greater susceptibility on the part of the male, it is very low during the later months of infancy (about 60).

THE MORTALITY SEX RATIO AND THE DEATH RATE

The mortality sex ratio does not remain constant but varies from year to year. This fluctuation is not wide during the ten years from 1915 to 1924, but if figures for longer periods of time are compared it will be seen that the variation is larger and follows more or less definite laws.

It has been pointed out by several observers,[10,11,12,13] that in such countries as Sweden and England and Wales, where mortality

[10] Allen, H. B., *et al.* Australia, Report on Infantile Mortality, 1917.

[11] Statistical Review, Registrar General, England and Wales (Text Part), 1921.

[12] Lenz, F. Übersterblichkeit der Knaben im Lichte der Vererbungslehre, *Arch. f. Hygiene*, 93: 126, 1923.

[13] Holmes, S. J., and Goff, J. C. Selective elimination of male infants under different environmental influences. Eugenics in Race and State, Baltimore, 1923, p. 233.

TABLE 4

The Mortality Sex Ratio and the Death Rate in Foreign Countries

The sex ratio is low in regions where the death rate is high and high where the death rate is low. Calculations made from data obtained from the 8th and 9th Annual Reports, Birth, Stillbirth, and Infant Mortality Statistics, U. S. A., 1922 and 1923. Correction made for sex discrepancy at birth.

COUNTRY AND YEAR	INFANT MORTALITY RATE	MORTALITY SEX RATIO
Chile		
1919	304	104
1920	264	103
1921	280	104
1922	240	106
Ceylon		
1919	224	105
1921	190	104
1922	189	106
1923	213	106
Japan		
1915	161	110
1916	170	111
1917	173	111
1919	170	109
1920	165	111
1921	168	111
1922	166	111
Jamaica		
1919		
1920	171	104
1922		
Austria		
1919	156	118
Italy		
1921	129	117
1922	126	112
1923	128	111
Germany		
1919	120	121
Uraguay		
1920	115	114
Finland		
1919–1920	113	119
1921–1922	103	120
Scotland		
1919	98	126
1920	92	129
1921	90	129
Denmark		
1919–1920	91	125
1921–1922	81	128
Canada		
1921	88	119
1922	87	122
Ireland		
1919–1920	85	120
Switzerland		
1919	82	126
1920	84	126
Netherlands		
1919	49	125
1920	73	131
1921	76	128
Norway		
1919	63	121
Australia		
1920	69	126
1921	66	126
1922	53	136
1923	61	123
1924	57	120
New Zealand		
1914–1915	51	131
1922–1923	43	135

records have been kept for a great many years, the fall in the death rate has been accompanied by a rise in the sex ratio. Most other countries also show this increase in the sex ratio as the infant death rate has declined. In countries where the death rate for infants is high the ratio is low, while in communities where the death rate is low the ratio is high (See Table 4.). Holmes and Goff presented further evidence of this inverse relationship by comparing the death rates according to sex in members of different social classes where death

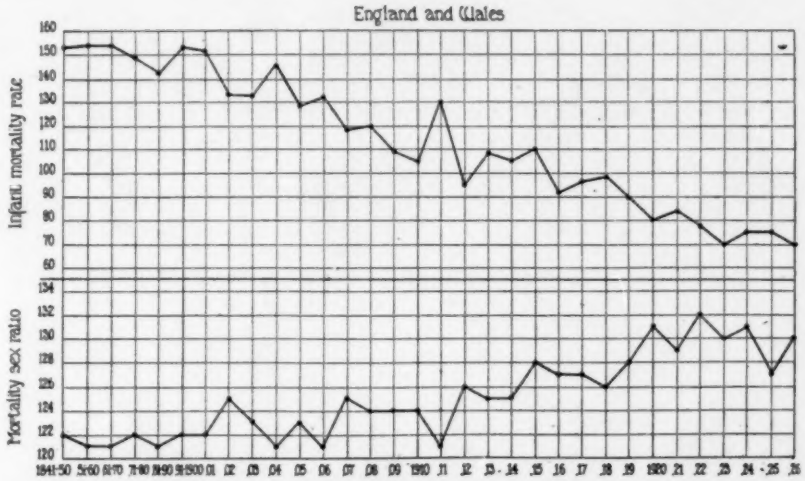

CHART 4. THE RELATIONSHIP BETWEEN THE DEATH RATE AND THE MORTALITY SEX RATIO (ENGLAND AND WALES, 1840–1926). The fall in the death rate after 1900 is accompanied by a rise in the mortality sex ratio.

rates vary (infants of native and foreign born parents for U. S. A., white and negro infants, legitimate and illegitimate children).

The relationship between the death rate and the mortality sex ratio for England and Wales is illustrated in Chart 4. In the decade 1841–1850 the infant death rate was 153 and the mortality sex ratio was 122. Up to 1900 there was little change in either of these. In 1901 the death rate was 151 and the ratio 122. Coincident with the fall in death rate starting after 1900, the ratio began to rise so that in 1926, with a death rate of 70, the ratio was 130. All along the line the two curves show excellent inverse correspondence, the lower curve being almost a mirror image of the upper. This is brought out particularly well if the curve is set on end.

In Table 5 are shown the changes in the mortality sex ratio for England and Wales from 1840 up to the present during the first five years of life. There is a rise starting after 1900 in the ratio at all ages, from the first three months of life up to the fifth year.

In Chart 5 the relationship between the infant mortality rate and the mortality sex ratio for Sweden and for England and Wales is illustrated by means of curves obtained by plotting these two variables against one another. The mortality rate is represented along the vertical axis, the sex ratio along the horizontal axis. The curves show excellent parallelism at all points. They illustrate well the increase in the sex ratio as the infant mortality ratio has fallen. In more recent years the increase in the sex ratio has been more marked than formerly as indicated by a bend in the curves to the right.

TABLE 5

Mortality Sex Ratios (England and Wales) During the First Five Years of Life. Coincident with the Decline in the Infant Mortality Rate After 1900 *There is a Rise in the Ratio at All the Age Periods*

YEAR	AGE-MORTALITY SEX RATIO							INFANT MORTALITY RATE
	0–3 months	3–6 months	6–12 months	2nd year	3rd year	4th year	5th year	
1840	132	125	119	105	97	99	101	153
1850	130	123	125	106	104	102	94	154
1890	131	122	120	106	102	99	103	142
1900	131	124	116	109	104	97	102	154
1905	134	123	121	107	104	97	99	128
1910	133	126	120	111	106	102	104	105
1915	139	131	125	111	111	105	108	110
1920	141	136	127	112	106	104	105	80
1925	131	138	124	113	107	104	113	75
1926	138	139	126	112	117	105	116	70

ENVIRONMENTAL FACTORS INFLUENCING THE MORTALITY SEX RATIO

a. Regional Differences in the Mortality Sex Ratio

The curves for England and Wales and Sweden, illustrated in Chart 5, are of similar form but they are not superimposed on one another, the curve for Sweden lying at a considerable distance to the left of the curve for England and Wales. Thus for a death rate of

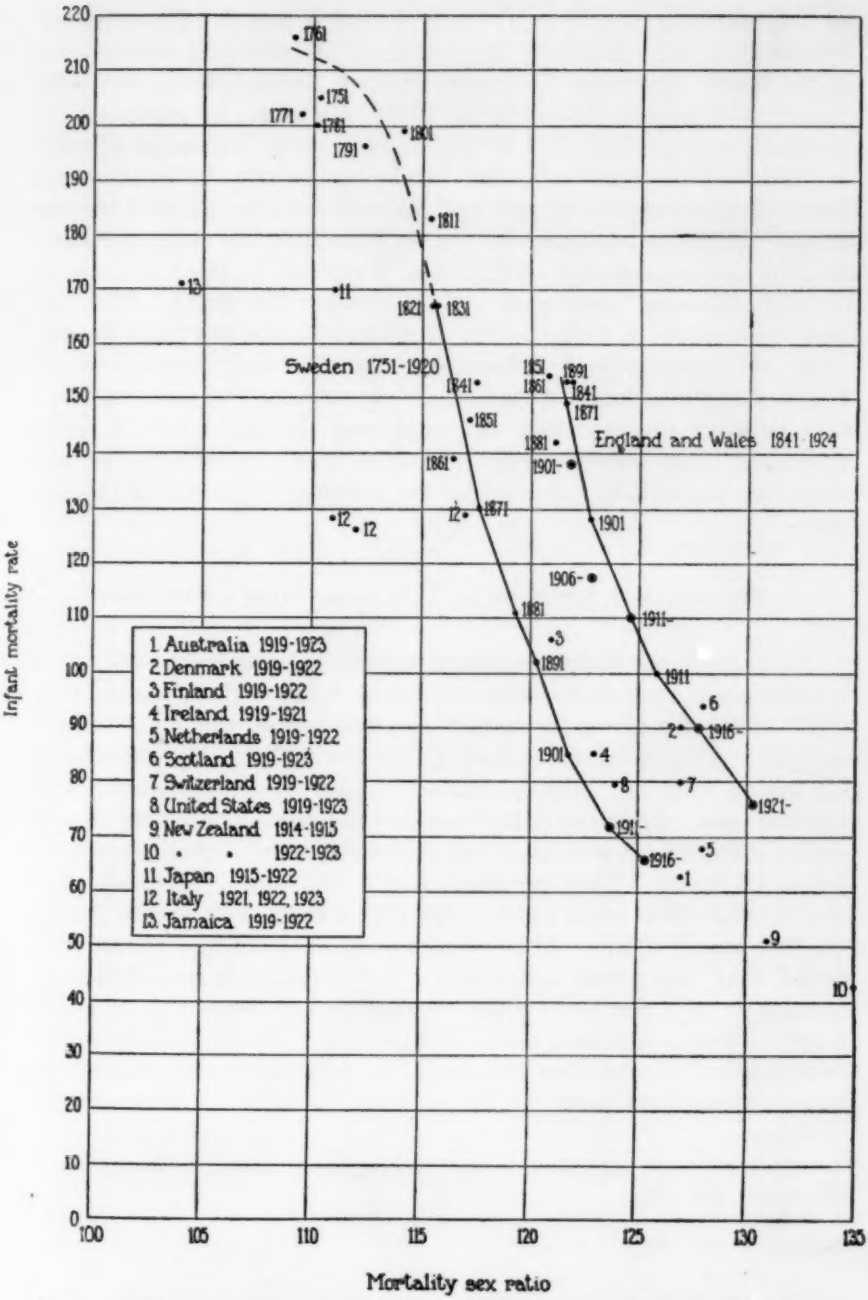

CHART 5. REGIONAL DIFFERENCES IN THE MORTALITY SEX RATIO. The relationship between the infant mortality rate and mortality sex ratio for various countries.

80 the mortality sex ratio in England and Wales is 129, while for Sweden it is 122. Similarly the points for all other countries shown in the figure (Australia, Denmark, Finland, Ireland, Italy, Jamaica, Japan, Netherlands, Switzerland, U. S. A.) with the exception of Scotland, also lie to the left of the English curve, indicating a lower sex ratio for the same mortality rate. Apparently the relationship between infant mortality rate and the sex ratio in different regions varies. Cf the countries represented in Chart 5 for the same mortality rate the ratio is highest in England and Wales and Scotland and lowest in Italy, Jamaica, and Japan. It is also low for Spain. It seems most reasonable to explain such variations in the sex ratio on the basis of environmental differences. Racially the populations of England and Wales and Australia are very similar,[14] yet the relationship between the mortality sex ratio and the death rate is quite different. That meteorological conditions have an influence on the mortality sex ratio is indicated by the seasonal variations in the sex ratio.

b. The Mortality Sex Ratio for Urban and Rural Communities

In Table 6, the infant mortality rates and the mortality sex ratios for urban and rural communities in the U. S. Birth Registration Area (1918–1924) are given by certain subdivisions of age. The infant mortality rate, except for infants in the second and third months of life during 1923 and 1924, is regularly higher in urban than in rural communities. From the data illustrated in Charts 4 and 5, we should expect that with a higher death rate in the cities, the mortality sex ratio would be lower. This, however, is not the case. The mortality sex ratio for cities tends to be higher rather than lower except during the first month of life. This has also been observed by Baker,[15] who found that the urban infant death rate of males exceeded that of females by 31.4 per cent, while the rural infant death rate of males exceeded that of females by only 27.4 per cent. Apparently the urban environment, though less favorable for both sexes, is particularly unfavorable for the male.

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[14] Robertson, T. B. Growth and Development. Abt's Pediatrics, Philadelphia 1: 475, 1923.

[15] Baker, J. E., City life and male mortality. *Pub. Am. Statistical Ass.*, Boston, 11: 133, 1910.

TABLE 6

Comparison of the Infant Mortality Rate and the Mortality Sex Ratios for Urban and Rural Communities, 1918–1924. Data from Tenth Annual Report, U. S. Birth, Stillbirth and Infant Mortality Statistics, 1924, p. 34. The death rate in urban communities is regularly higher than in rural but the mortality sex ratio for the cities tends to be higher rather than lower except during the first month of life

YEAR		INFANT MORTALITY RATES AND MORTALITY SEX RATIO													
		Under 1 Year		1st month		2nd month		3rd Month		4-5-6 Months		7-8-9 Months		10-11-12 Months	
		Rate	Ratio	Rate	Ratio	Rate	Ratio	Rate	Ratio	Rate	Ratio	Rate	Ratio	Rate	Ratio
1918	urb.	107.8	123	45.3	128	8.9	130	7.5	129	17.8	123	15.4	120	13.0	106
	rur.	93.5	122	43.2	130	8.1	125	6.2	120	14.6	124	11.7	108	9.7	104
1919	urb.	90.4	125	41.9	128	7.3	130	6.2	128	14.7	126	11.4	118	8.8	111
	rur.	82.9	125	40.7	132	7.3	135	5.7	122	12.7	120	9.3	118	7.2	113
1920	urb.	92.2	126	42.9	129	7.5	133	6.1	124	14.4	128	11.6	119	9.7	113
	rur.	79.4	125	39.9	129	6.9	130	5.3	129	11.8	122	8.4	116	7.1	109
1921	urb.	82.9	124	43.4	124	6.6	130	5.2	126	12.0	122	8.9	115	6.8	110
	rur.	73.6	125	39.0	129	6.4	121	5.0	133	10.6	119	7.2	122	5.5	110
1922	urb.	80.7	127	40.6	129	6.3	134	5.1	136	11.6	128	9.4	122	7.7	112
	rur.	72.2	127	39.4	130	6.1	130	4.5	125	9.7	126	6.9	123	5.5	112
1923	urb.	78.4	126	39.9	128	6.0	133	4.7	124	11.3	126	9.0	120	7.4	116
	rur.	76.1	123	39.7	127	7.0	126	5.0	128	10.7	121	7.7	117	6.1	105
1924	urb.	72.6	126	39.2	127	5.6	131	4.3	135	9.8	126	7.4	119	6.2	114
	rur.	68.9	127	38.1	131	6.1	131	4.5	128	9.1	125	6.1	116	4.9	113

c. Seasonal Variations in the Mortality Sex Ratio

A curve showing the mortality sex ratios for deaths due to all causes under one year for the U. S. Birth Registration Area by months of the year during a five year period (1918–1922) is illustrated in Chart 6. The months are indicated along the horizontal axis, the ratio along the vertical axis. There is a rise in the mortality sex ratio starting in November and December, reaching a maximum in February and

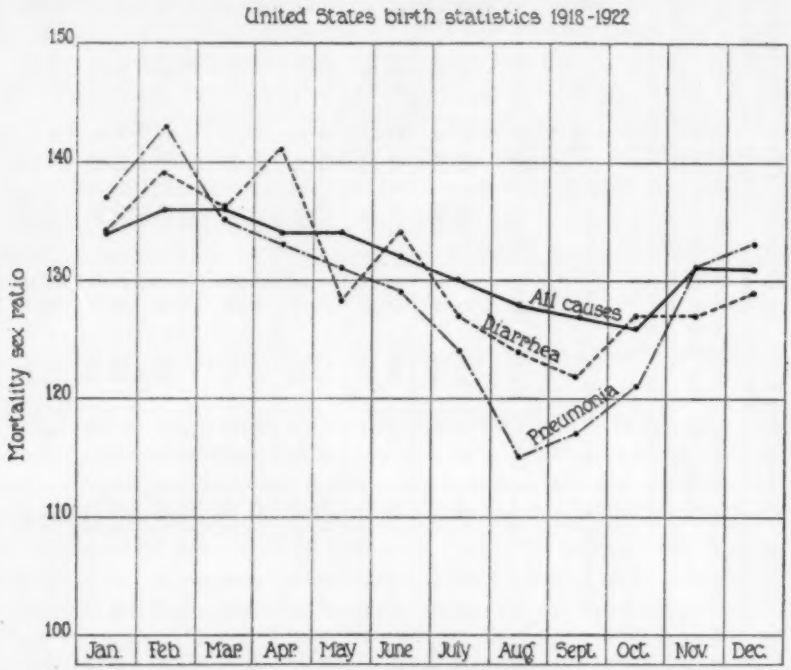

CHART 6. SEASONAL VARIATIONS IN THE MORTALITY SEX RATIO OF INFANTS FOR DEATHS FROM ALL CAUSES, DEATHS FROM PNEUMONIA (ALL FORMS), AND DEATHS FROM DIARRHEAL DISEASES. The ratio is high during the winter and early spring months and low during the summer and autumn months. The most marked seasonal variations occur for pneumonia.

March, and then falling during the summer months. These fluctuations occur for individual years as well as for the total five year period.

That a similar seasonal fluctuation in the sex ratio occurs for pneumonia and for diarrheal diseases is also illustrated in the same chart. The fluctuation is marked for pneumonia, for which the ratio varies from 143 in February to 115 in August. For diarrhea the

mortality sex ratio varies from 141 in April to 122 in September. The data for 1924 show similar seasonal fluctuations.[16]

TABLE 7

Seasonal Variations in the Sex Ratio for Various Diseases in Infants Under One Year. (*U. S. Birth Registration Area.* 1918–1922)

CAUSE OF DEATH	MORTALITY SEX RATIO											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
All Causes	134	136	136	134	134	132	130	128	127	127	131	131
Pneumonia (all forms)	137	143	135	133	131	129	124	115	117	121	131	132
Diarrheal Diseases	134	139	136	141	128	134	127	124	122	127	127	129
Congenital Debility	137	140	139	142	139	145	138	136	134	129	133	134
Prematurity	131	133	133	126	133	131	137	133	129	127	131	131
Pertussis	100	105	102	94	95	92	89	97	100	91	81	92

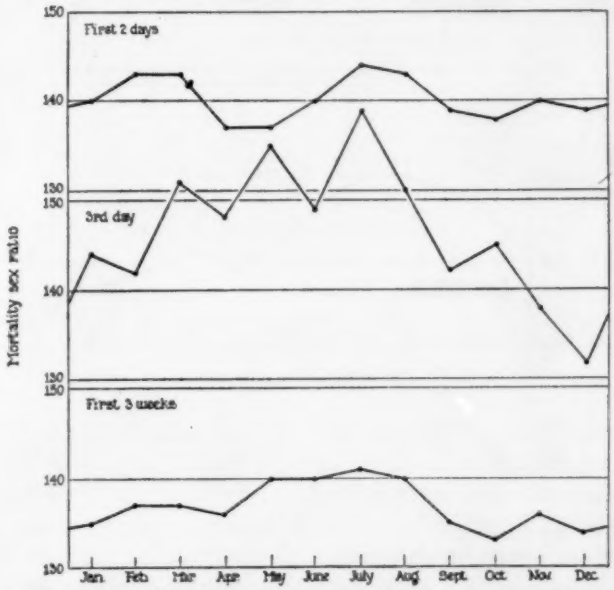

CHART 7. SEASONAL VARIATIONS IN THE MORTALITY SEX RATIO FOR THE FIRST THREE WEEKS OF LIFE IN CERTAIN SUBDIVISIONS OF AGE. The rise in the mortality sex ratio during the summer months is particularly marked on the third day of life.

There is an irregular seasonal variation for the group of diseases included under "congenital debility" (Table 7) but almost no variation

[16] Tenth Annual Report, U. S. Birth, Stillbirth, and Infant Mortality Statistics, 1924, p. 37.

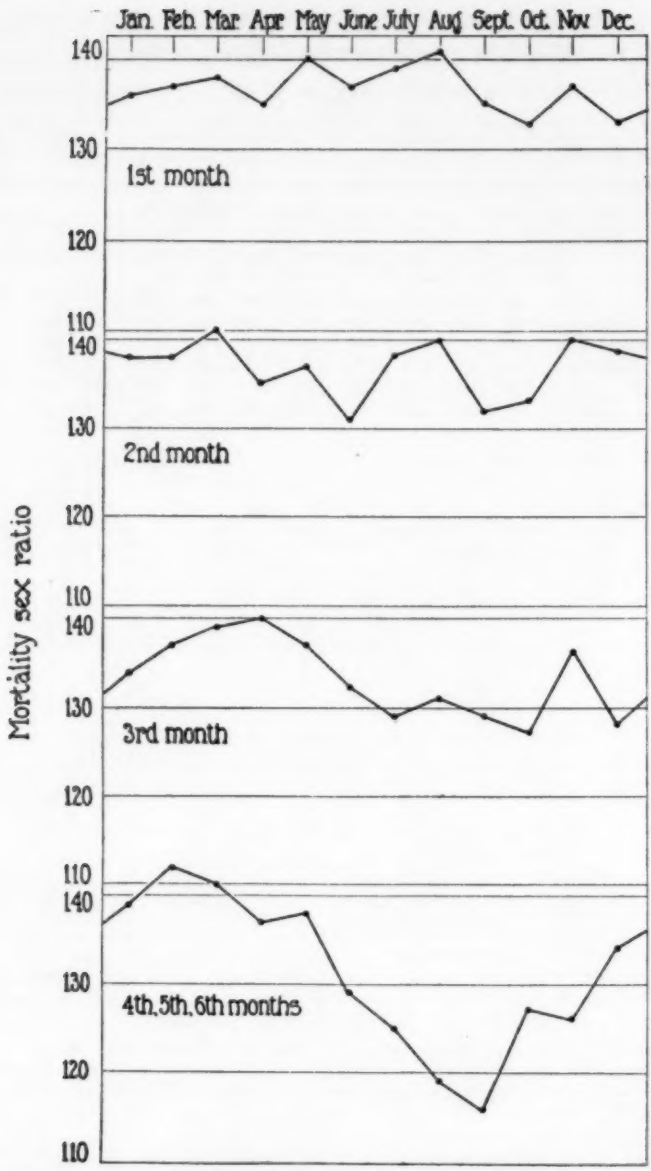

CHART 8. SEASONAL VARIATIONS IN THE MORTALITY SEX RATIO DURING THE FIRST YEAR OF LIFE IN CERTAIN SUBDIVISIONS OF AGE. After the first two months of life the ratio is high during the winter months, and low during the summer.

for deaths attributed to "prematurity." This is to be expected since prematurely born infants are ordinarily kept indoors, protected against climatic changes and in an artificial environment as regards temperature, humidity and sunlight. Nevertheless, even in the case of these infants, the mortality sex ratio is lowest during September and October (127 as compared with 133 in February and March).

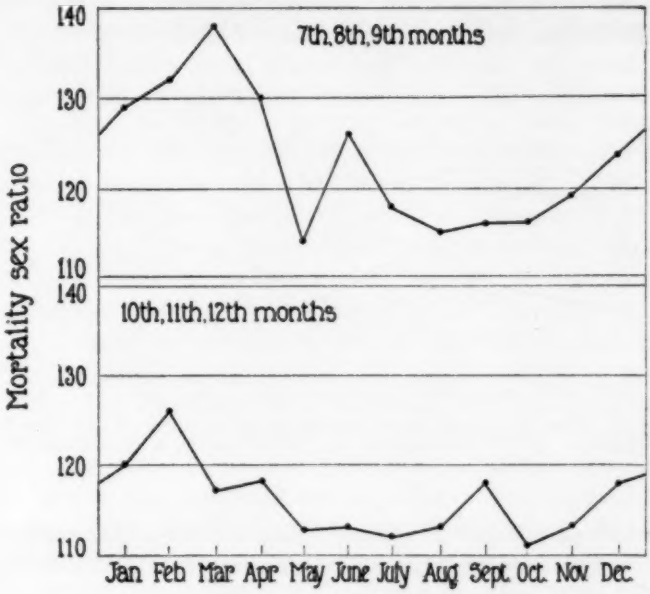

CHART 8. (*Continued*).

The seasonal variation for pertussis is of particular interest since it is the only disease in infancy (except pyelitis) to which females show marked predisposition. The number of deaths from this cause is not large enough to justify conclusions that are more than suggestive. In the five year period studied (1918–1922) there were less than nine-hundred deaths during the month of December. The ratio was highest during February (105) and lowest during November (81).

These seasonal variations in the sex ratio cannot be attributed to seasonal variations in the death rate. The peaks for the death rates from pneumonia and diarrhea occur at different times of the year, yet the seasonal curves for the sex ratio are similar.

In Charts 7 and 8 are represented seasonal curves for the mortality sex ratios of infants by certain subdivisions of age (first two days of

life, third day, first three weeks, etc.). During the first two days the curve is irregular, but after this distinct seasonal variations in the sex ratio occur. On the third day of life there is a striking seasonal variation, the ratio rising markedly during the summer months (from 132 in the month of December to 162 in July). Each point that has been plotted is based on over 2000 deaths. Furthermore, seasonal curves for odd and even years show a similar variation. A seasonal curve was plotted separately for the third day of life because on this day, as stated above, the mortality sex ratio is much higher than during the first two days of life. For infants from four to seven days of age

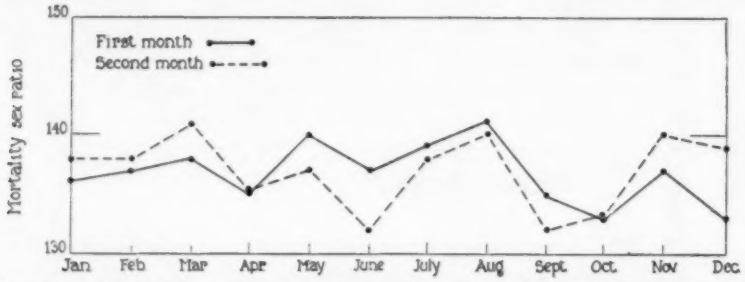

CHART 9. SEASONAL VARIATIONS IN THE MORTALITY SEX RATIO FOR THE FIRST TWO MONTHS OF LIFE. The ratio for the second month is higher than for the first during the winter months, and lower during the summer months.

there is also an increase in the mortality sex ratio during the summer months, the ratio rising from 127 in January to 142 in July and then declining to 134 in December.

During the first three weeks the seasonal curve continues to show a higher mortality sex ratio during the summer months. A separate curve was plotted for the first three weeks of life because after three weeks of age the curve for the mortality sex ratio, which has been declining up to that age, starts to rise again.

During the second month of life the seasonal curve shows two waves with one peak from November to March and another during July and August. After the second month, the sex ratio is uniformly lower during the summer. From the fourth to the ninth month the fluctuations are very marked. From the fourth through the sixth month the ratio varies from 143 in February to 116 in September, and from the seventh through the ninth month it varies from 138 in March to 115 in August. During the last 3 months of the first year, the variation is less, from 126 in February to 112 in July.

The fact that the mortality sex ratio during the second month of life is higher than during the first month has been mentioned. Comparison of the seasonal curves for these age periods (Chart 9) shows that this difference is due to the higher sex ratio for infants of two months of age during the winter months. During the summer the ratio is lower than in the first month of life. Apparently an environmental factor is operative during the winter months in the case of infants in the second month of life, which is without influence during the first month of life.

Seasonal data for England and Wales (1914–1920), obtained through the kindness of the Registrar General of Great Britain, are shown in Table 8. The direction of the seasonal variation in the sex ratio corresponds exactly with that found in America. The ratio is highest during the first quarter of the year (January–March) and lowest during the third quarter (July–September), except during the first month of life, when as in America, the ratio is high during the summer months and low during the winter. The seasonal curves for the sex ratio in pneumonia (all forms) and diarrhea and enteritis are also similar to the American.

The statement has been made that the mortality sex ratio tends to fall as the age increases (Chart 2). Though this is true when the sex ratio is compared for age subdivisions of the first year without regard to season, the seasonal curves indicate that until the ninth month at least, there are times of the year during which the sex ratio differs only slightly from that at birth. If we assume that the season during which the ratio is lowest is the period most favorable for males, then it is seen that the susceptibility of males over females does diminish as the end of the year is approached. This is brought out in Table 9, where the highest and lowest points reached by the sex ratio are compared for subdivisions of age during the first year. Except on the third day of life,* when the ratio is unusually high, there is little change in the maximum sex ratio until after the ninth month of life. The minimum sex ratio, however, falls steadily from 134 in the first month to 112 in the last three months.

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* In the U. S. Birth, Stillbirth, and Infant Mortality Statistics, data are given separately for deaths on the first, second, and third days of life (designated as under 1 day, 1 day, 2 days). The next age subdivision is 4–7 days. Though it is possible to say that the mortality sex ratio is higher on the third day than on the first or second, it is not possible to determine whether it is higher than that for any individual day after this.

TABLE 8

Seasonal Variations in the Mortality Sex Ratio (England & Wales, 1914–1920). Except in the first month of life the ratio is high during the winter and low during the summer

Deaths Due to All Causes

QUARTER ENDING IN	SEX	UNDER 1 YEAR		UNDER 1 MONTH		2–3 MONTHS		4–6 MONTHS		7–12 MONTHS	
		Deaths	Ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio
March.....	M	92235	136	33404	135	18051	143	15446	139	25334	129
	F	67941		24673		12572		11141		19555	
June.....	M	68044	133	29093	137	11279	139	9644	134	18028	123
	F	51171		21188		8139		7159		14685	
September..	M	64900	131	25949	138	11929	137	11866	127	15156	119
	F	49558		18749		8703		9352		12754	
December...	M	71909	132	29216	134	13922	142	12421	134	16350	122
	F	54375		21874		9795		9304		13402	

Pneumonia (All Forms)

QUARTER ENDING IN	SEX	UNDER 1 YEAR		UNDER 1 MONTH		2–3 MONTHS		4–6 MONTHS		7–12 MONTHS	
		Deaths	ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio
March.....	M	16008	144	695	126	2743	155	3796	149	8774	141
	F	11109		550		1773		2547		6239	
June.....	M	7959	141	358	151	1073	149	1725	145	4803	138
	F	5634		237		718		1188		3491	
September..	M	3382	128	205	155	515	138	824	134	1838	120
	F	2649		132		373		615		1529	
December...	M	7844	138	443	139	1356	153	1921	141	4124	133
	F	5679		320		885		1363		3111	

Diarrhoea & Enteritis

QUARTER ENDING IN	SEX	UNDER 1 YEAR		UNDER 1 MONTH		2–3 MONTHS		4–6 MONTHS		7–12 MONTHS	
		Deaths	Ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio	Deaths	Ratio
March.....	M	5073	147	671	174	1610	169	1583	143	1209	121
	F	3443		385		951		1106		1001	
June.....	M	4530	144	643	173	1419	168	1353	148	1115	111
	F	3147		372		844		914		1017	
September..	M	17012	131	1055	177	3916	146	5767	129	6274	120
	F	13011		596		2683		4489		5243	
December...	M	9490	133	739	157	2543	154	3115	130	3093	118
	F	7121		471		1647		2397		2606	

TABLE 9

The Seasonal Maximum and Minimum Mortality Sex Ratios for Certain Age Subdivisions of the First Year. (*U. S. Birth Registration Area*, 1918–1922)

AGE	MORTALITY SEX RATIO		
	Highest Ratio	Lowest Ratio	Difference
1st 2 days	144	137	7
3rd day	160	132	28
1st 3 weeks	141	133	8
4th week	142	124	18
1st month	141	134	7
2nd month	141	131	10
3rd month	140	127	13
4th, 5th, 6th months	143	116	27
7th, 8th, 9th months	138	115	23
10th, 11th, 12th months	126	112	14

THE RISE IN THE MORTALITY SEX RATIO ON THE THIRD DAY OF LIFE

Mortality rates help little in understanding the mechanism of the curious rise in the mortality sex ratio on the third day of life. The death rate falls steadily and smoothly during the first days of life. Diagnoses are worth little at this early age because of the meager knowledge regarding disease conditions in the new-born. One might suppose that deaths from birth injuries, in which the sex ratio is high, may occur in greater number on the third day. This is not borne out by mortality records, which show a diminishing number of deaths from birth injury after the first day. The death rate from convulsions rises during the new born period and is regularly higher on the third day than on any other day during the first week. The number of deaths from this cause, however, is too small to influence the sex ratio.

DISCUSSION

Maleness is an important factor in determining the outcome of disease during infancy. The innate hypersusceptibility of the male is influenced by various environmental factors. Adverse influences are certain climates, such as that of England, Wales and Scotland, urban life, and the winter and early spring months. Favorable influences are climates like that of Italy, Japan, Jamaica and Spain, rural life

and the summer and autumn seasons. These two groups of influences differ in at least one important factor, the amount of sunlight to which infants living under these various conditions are exposed. England, Wales and Scotland are notoriously poor in sunlight, while Italy, Japan, Jamaica and Spain are countries which abound in sunlight and with populations which live to a large extent outdoors. It seems reasonable to suppose that infants in rural communities get more sunlight than do those in the city, where life is to a much larger extent confined to indoor living and where sunlight, particularly the ultraviolet portion, is obscured by dust and smoke. That the quantity of sunlight reaching the infant during the summer months is greater than during the winter is obvious.

Some of the harmful effects of the absence of sunlight for infants are now well known. The ultraviolet rays of the sun, particularly those in the region of 3000 Ångstrom units, are of the greatest importance in regulating calcium metabolism. Ultraviolet radiant energy or a substitute is necessary for the proper deposition of calcium in bone and for the maintenance of a normal calcium concentration in the circulating fluids. Rickets may be prevented and cured both in animals and in infants by ultraviolet radiation. Infantile tetany is promptly cured by exposure to ultraviolet radiant energy, and recovery is accompanied by a return of the serum calcium to a normal level.

That a difference exists between the calcium regulatory mechanism in males and in females is shown by the higher incidence of tetany among male infants. In a series of 168 patients[17] infantile tetany occured more than twice as often in boys as in girls. The sex difference in the tendency to tetanic hypocalcemia is more marked in young infants. Whether or not rickets is more common in boys that in girls has not yet been determined. For the United States (white infants only)[7] the ratio of boys to girls recorded as dying of rickets is 143. The British data give a still higher ratio, 158. Though this fact is interesting, too much stress cannot be laid on it, since rickets can hardly be a cause of death in any large number of instances. According to Pfaundler,[18] Priestly in a series of 75,000 cases found rickets twice as common in males as in females.

Though tetany itself occurs frequently, it does not figure largely as a primary cause of death. As a subsidiary cause of death, however,

[17] Bakwin, H., and Bakwin, R. M., The sex factor in infantile tetany, *Am. J. Dis. Child.*, 35: 964, 1928.

[18] Pfaundler, M. *Münch. med. Wchschr.*, 29 Apr. 1927, p. 721.

hypocalcemia is probably more much important than is generally supposed. In a recent study of the seasonal variation in the serum calcium concentration of infants,[19] it was found that during the months of February and March, 1926 and 1927, values of 8.0 mg. per cent or lower were obtained in 34 out of 126 infants (27 per cent) entering the medical wards at Bellevue Hospital. During October, 1926, none of the 46 infants examined had serum calcium values of 8.0 mg. or lower. It seems likely that a reduction in the concentration of calcium in the circulating fluids, which is so important in regulating neuromuscular activity, is injurious to the individual and may be sufficient to decide the fate in a very sick child.*

Carlson[20] has observed that dogs with parathyroidectomy tetany are very susceptible to infections of the eyes, nose, and respiratory passages. In order to test out the possibility of this increased susceptibility being due to a depression of the process of immunization, he immunized dogs at varying periods before and after parathyroidectomy against goat cells and found that none of his dogs developed lysin to goat corpuscles to the degree observed in normal dogs.

In view of these considerations, therefore, the possibility suggests itself that the higher proportion of male deaths in such countries as England, Wales and Scotland, in cities, and during the winter months is dependent, in part at least, on the greater instability of the calcium regulatory mechanism in male infants. This view corresponds with the general clinical impression that infants with rickets withstand disease, particularly pneumonia, poorly. The seasonal curve for the frequency of rickets and tetany corresponds exactly with the seasonal curve for the mortality sex ratio. Furthermore, the seasonal curve for the mortality sex ratio during the first three weeks of life, during which time hypocalcemia is probably not present in any large number of instances, does not parallel the curve for the later months, the ratio being high during the summer months and low during the winter months.

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[19] Bakwin, H., and Bakwin, R. M. Seasonal variation in the calcium content of infants' serum. *Am. J. Dis. Child.*, 34: 994. Dec. 1927.

* There is some reason to believe that a disturbance in the calcium regulatory mechanism may be present in infants without rickets or tetany and in whom the values for the calcium and inorganic phosphorus of the blood are within normal limits. It has been our experience that there is a greater tendency for the serum calcium to fall in infants who develop infections during the winter months than in those with infections during the summer months.

[20] Carlson, A. J. Parathyroid tetany and active immunity. *Proc. Soc. Exper. Biol. & Med.*, 10: 187, 1912–1913.

The occurrence of tetanic hypocalcemia during the second and third months of life is generally considered rare, and if the explanation herein offered is correct, the fact that the seasonal curve is less marked at this age would in part bear out this clinical impression. The condition does occur in young infants, however, but is often missed, largely because it does not present the classical symptom complex. At this age, convulsions[21] are commonly the only clinical manifestation of the condition, laryngospasm, carpopedal spasm and mechanical hyperirritability being absent. In young infants with tetany, manifest rickets is rare, and ignorance of this fact often results in failure to make the diagnosis. But since the demonstration of the close relationship between infantile tetany and hypocalcemia[22] and the development of accurate methods for determining calcium in small amounts of serum,[23] the recognized number of instances of tetany in young infants has increased; and if this possibility of the presence of tetany is kept in mind in the case of all young infants in whom convulsions without apparent organic basis occur, the diagnosis will be made much more frequently. Of the 168 patients with tetany, mentioned above, 39 (23 per cent) were 4 months old or less. Conditions during the first and second months of life are favorable for the development of the tetanic hypocalcemia. At this age infants are often kept closely confined indoors, without exposure to sunlight.

It has been the purpose of this study to discuss sex as one of the factors determining the outcome of disease during infancy. At this time of life no disease is known from which individuals of both sexes die in numbers proportional to their ratio in the population. Even deaths attributed to "accidental causes" and to "lack of care" are more common among males than among females. Traumata, lethal for males, may be without effect in females.

As the infant mortality rate has decreased during recent years, there has been a rise in the sex ratio. Apparently the environmental changes which have brought about the reduction in the infant death rate have benefited the female more than the male. It seems not at all unlikely, however, that environmental changes may be effected in the future from which the male will benefit much more than hitherto.

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[21] Nassau, E. Zur Klinik der manifesten Tetanie im Säuglingsalter. *Ztschr. f. Kinderh.*, 28: 310, 1921.

[22] Howland, J., and Marriott, W. M. Observations upon the calcium content of the blood in infantile tetany. *Quart. J. Med.*, 11: 289, 1917–1918.

[23] Kramer, B., and Tisdall, F. F. *J. Biol. Chem.*, 48: 223, 1921.

This possibility is suggested by the regional and seasonal differences in the mortality sex ratio.

It seems reasonable to assume that the season of the year at which the sex ratio is lowest represents that regional climatic "environment" most favorable for the male. If the mortality sex ratio during the entire year could be reduced to this low level many deaths would be prevented. During the five year period studied for the preparation of Chart 7 (1918–1922), there were 645,903 deaths from all causes in infants in the U. S. Birth Registration Area, with a sex ratio of 133.8. If this ratio had been 126.5 instead, the lowest point reached by the ratio for that period, the lives of approximately 21,000 males would have been saved during the five year period. This calculation is only for the birth registration area of the United States, which constituted 53 per cent of the population in 1918, and 72 per cent in 1922.

It is therefore of more than academic interest to know what the environmental factor or factors are which react so unfavorably on male infants. If the hypothesis suggested above proves to be true, namely that variations in the amount of sunlight determine the regional and seasonal differences in the mortality sex ratio through the stabilizing effect on the calcium regulatory mechanism, a method for the reduction of the mortality sex ratio by means of artificial sunlight or a substitute is strongly indicated.

SUMMARY AND CONCLUSION

1. During the ten year period, 1915–1924, there were from 130 to 134 deaths in white male infants under one year to 100 deaths in white female infants under one year in the U. S. Birth Registration Area.

2. The mortality sex ratio is highest at birth and decreases with age.

3. There are two exceptions to this rule: (1) The sex ratio is higher on the third day of life than at birth. (2) The sex ratio is higher during the second month than during the first.

4. After the first year the ratio continues to fall so that during the fourth year the death rate for both sexes is about equal. There is a rise in the ratio during the fifth year.

5. Coincident with the fall in the infant mortality rate which has taken place since 1900, there has been a rise in the mortality sex ratio, indicating that the reduction in mortality rate has been greater for females than for males.

6. There are regional differences in the mortality sex ratios. For the same infant death rate the ratio is high in England, Wales and Scotland, and low in Italy, Japan, Jamaica, and Spain, and higher in urban than in rural communities.

7. There are seasonal differences in the mortality sex ratio, varying with the age of the infant. During the first month of life the ratio is high during the summer and low during the winter. After the second month the ratio is regularly lower during the summer months.

8. It is suggested that the regional and seasonal variations in the mortality sex ratio are dependent on the differences in the amount of sunlight reaching the infant. The greater need of the male infant for sunlight is indicated by his tendency to develop conditions (tetany and possibly rickets) due to instability of the calcium regulatory mechanism.

BIOLOGICAL PHILOSOPHY AND MEDICINE*

BY GEORGE DRAPER, M.D.

Ordinarily, the first question which we put to an explorer returning from strange peoples, is, "What do they look like?" We want to know whether they are tall or short, fat or lean, colored or white. Then if our interest is aroused we demand more details. It sharpens our imagined picture of the strangers if we can gain some idea of the shape and proportions of different parts of the head and body. We become eager to learn of the placing of their eyes, the form and quality of lips, jaws and teeth; the texture of their skins, the nature and distribution of surface hair, and the contours made by underlying muscles and accumulations of fat. But the attention of most naturalists is not long held by consideration alone of the physical aspect of so complicated a specimen as Man. Beyond this physical picture of the objective creature, we seek for information about his habits, muscular strength, endurance and agility, nature of his food, and how he digests it. The resistance he has to infecting agents and toxins arouses the imagination of those whose interest lies in physiological processes and the forces of immunity. Sociologists desire to hear of his methods of community life, and finally the psychologist would know of his postures, gestures, facial expression, general behavior and dreams, which may disclose the inner world of his psychic life. All these various questions which his eager hearers put to the explorer are but the proof of the soundness of Pope's view that "the proper study of mankind is Man." Indeed that is what each one of us is doing, consciously or unconsciously, every moment of our waking social lives. We are continually putting to ourselves three questions: How do they look? How do they move and behave? How do they feel and think? And, when alone, it is ourselves and our personal environment we chiefly contemplate.

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ENVIRONMENT AND RESPONSE

Clearly the answer of these broad interrogations will vary with the ever changing conditions of the creature's surroundings. For if a living organism depends for its life first upon its sensitiveness to environment and secondly upon its ability to respond to sensation with action, the latter becomes objective evidence of its capacity to feel and react. Dead matter, obviously, falls quite outside such a formulation; environment has no dynamic relationship with it. Consequently it is impossible, as Dewey (1) remarks, to conceive of a living organism apart from its surrounding universe. But although all the general and detailed features of the world about us are, as far as this or that locality is concerned, at any moment actually present, they are not equally realized by the various forms of animal life which inhabit the district. Each species, and within the species, each individual can relate itself to the environment only in terms of its own natural endowments. These may express the simplicity of the one celled amoeba or the amazing elaboration achieved in the central nervous system of Man. It must follow, therefore, that the special environment of any given creature holds for it only those elements which its sensibilities enable it to perceive. One might visualize, for example, an earthworm at a road side. From the soft soil beneath the marginal sod this worm emerges upon the hard unyielding surface of the drive. At once the worm's advancing tip is arrested, then recoils. A difference in the consistency of its environment has been appreciated by that primitive sensory apparatus, capable only, let us say, of such limited discrimination. Now imagine that instead of a hard paved driveway the worm had chanced to move out upon the surface of a soft, perhaps slightly moist country road. In this instance the creature's advancing tip would note no material change in consistency from the marginal soil, and would continue its progress until it reached the ruts where wagon wheels had run. At this moment let us suppose that a horse drawn vehicle approaches. The horse's hoofs strike the ground and there is friction between stones, earth and the revolving wheels. But the worm, lacking the necessary special perceptive sense, remains unaware of the physical sound phenomena produced by these new elements in its environment, and is crushed. A rabbit, on the other hand, which had been crouching in the wayside grass at the same place, might have ventured simultaneously out upon the road. Ears pricked forward, eyes bright

at each quick turn of the head, nostrils quivering, the tense alert animal occupies in the same place and at the same moment an infinitely more vast and complicated environment than the worm. The rabbit's world, in addition to physical impacts, would hold sounds, sights, tastes, and smells. For this more elaborately endowed creature, then, the approaching hoof beats, crunching tire and spectacle of horse and wagon would form warnings of peril. And the responsive leap, swift as a shadow, would remove the rabbit in ample time from that danger point. It would appear, furthermore, from this illustration, not only that the rabbit's environment had been enlarged by his greater sensibilities but also that his action capacity had developed commensurately to meet the more varied problems which thereby confronted him.

Students of natural history generally agree that Nature's purpose seems to be continually to evolve new forms of living organisms (Darwin, 2). But the real problem which she must meet successfully in this project, if the new creatures are to survive, is to achieve the proper balance between powers of perception and capacity for action. In other words, the highly organized animal's environment is so complicated and extensive that the finest combination of endurance, speed, strength and understanding is necessary to negotiate it successfully. In this connection the term understanding is deemed to include among its various connotations the faculty of storing up realized experience for future reference. It would almost seem, however, that nature had purposely turned this game of life into a difficult and fascinating sporting event, by forever introducing certain unexpected or entirely novel hazards into the environmental conditions. For all species, even those most highly endowed with perceptive ability, these hazards fall roughly into two groups. The first and simplest is formed of what may properly be called accidents. They comprise situations wherein some previously recognized menace is momentarily concealed so that it escapes detection, or arrives so swiftly and unannounced that it wins over perception and action. For example, we might suppose that the rabbit, leaping to escape the approaching horse and wagon, came down upon the erect quills of a hedge-hog, defensively crouching beneath the leaves at the roadside. The injuries to the rabbit would be severe and painful, perhaps fatal. But the episode seems to fall properly under the dictate of chance. The other class of hazards embraces situations in which peculiar and previously unexperienced elements are introduced into

the animal's environment. No better illustration of these unique, unknown and unexpected difficulties in the game of life can be found than is set forth in the story of bacteriology. The sportsmanlike address of the human race to this type of obstacle, and its thrilling passage under the keen leadership of Pasteur, Koch, Lister, Bordet, Theobald Smith and a host of others, is a tribute to nature's skill and justice as a balancer of forces. The achievements of these pioneers clearly proclaim anew that the key to Man's ability in the art of adaptation to his amazingly elaborate and extended universe was long since held out to him by King Solomon, when that intelligent monarch extolled understanding and wisdom in his Apocryphal pronouncements. The same philosophy too was later revived by Sir Thomas Browne in those dignified and charming lines from the *Religio Medici:*

> Search while thou wilt, then let thy reason go,
> To ransom truth, e'en to th' abyss below;
> Rally the scatter'd causes, and that line
> Which nature twists be able to untwine.

SECONDARY EFFECTS OF INJURY

But there is perhaps another aspect of the problem of adjustment of various kinds of living beings to their several environments which has peculiar significance for the physician. The injuries and suffering, indeed disease, which arise from collision with one or other of the two groups of obstacles, accidental or natural, disable the whole organism. No matter how slight the lesion may be, there ensues a limitation of the action capacity of the entire animal. In the lower forms, and let us return momentarily for discussion to our earthworm, there are not many different varieties of specialized tissues. Furthermore, their anatomical relationships are such that it is difficult, by any worm-degree environmental menace, to injure one tissue without also wounding the remaining few adjacent ones. Repair likewise follows the identical process reversed. Thus if the advancing wagon wheel misses the whole worm, and severs merely a portion of its tip, the whole termination will regenerate anatomically and functionally perfect. Following the injury, however, and during the process of regrowth, the action capacity of the worm will be reduced. In the case of more highly organized creatures, especially man, the great number, variety and fine specialization of tissues has resulted in anatomical and functional separation of the parts. It follows from this situation that the impact of any man-degree menace may act

upon one part of tissue locally, as it were, and there produce a lesion. All the other organs appear, for the moment, to escape entirely. If, for example, the impact be that of a physical force which breaks a thigh bone, or shatters the patellar, the other bones, brain, heart and digestive system remain structurally intact. Then, just as in the case of the worm, the whole vital machine is disabled, its action capacity is reduced. But there is another quite different set of phenomena which follows injury to one part in Man. By virtue of the coordinating central nervous system innumerable intercommunications exist between the parts, which permit secondary or indirect effects upon remote and functionally unrelated organs. The common circumstance of surgical shock, with sudden and continued lowering of blood pressure and all the symptoms of collapse, is an example of the general secondary reaction which may follow the local injury of shattering the patellar. Or, in another individual, under the same circumstances, there may be nausea and vomiting, and in another loss of consciousness. Indeed these secondary effects in organs or systems anatomically and functionally unrelated to the site of injury, may be far more serious than the initial trauma itself. It is well known, for example, that a patient may die in the shock following a crushing injury to a part which is not itself essential to life.

Unfortunately, however, the environment of human beings has become so infinitely extended because of their apparently limitless perceptive powers, that man-degree menaces may assault them in vast array from many quarters. Indeed that effective environment reaches beyond the limits set by the range and sensitiveness of the five senses. For the mind, by reason of its imaginative faculty and the phantasy life, is capable of setting up a new and complete universe of its own, from which may flow menacing forces as potent as those which arise in the individual's physical surroundings. Whether or not these too are the result of physical stimuli, whose nature is still unknown, is a matter of speculation which falls outside the purpose of this discussion. The important point is that, regardless of their nature or their source, these so-called psychic productions can powerfully influence physiological function. To illustrate this fact it is only necessary to mention the well known violent effect upon intestinal function which is produced by the fear emotion. Consequently there is no essential difference in the nature of the general physiological disturbances produced by the force which fractures a bone or by the feeling state of emotional origin. Clearly the range in the type

of injurious experience which separates the fracture disturbance and the emotional one is extreme. But this situation serves only to indicate the innumerable gross and subtle obstacles arising in a physical and spiritual universe which nature has provided to match the superb equipment of her creature Man.

DISEASE AS A MALADJUSTMENT OF ORGANISM AND ENVIRONMENT

From the foregoing discussion it would appear that any display of action capacity, that is, any movement, gesture or conative act, indicates a preceding feeling experience. This principle holds true whether the perceived thrust of environment arises from Man's palpable, physical universe or in that more extended world of his phantasy productions. Therefore, one may posit the axiom that any action of any living organism is in truth reaction to a previously perceived external physical or psychic stimulus. The smooth, lithe, beautifully coordinated movements of an animal in the forest, or of a man easily lifting and carrying weights, or making an astronomical calculation, all bespeak the fulfillment of Nature's effort to work out successful adaptations. When this has been achieved for a given form, the organism is said to be in a state of health. But at any point the sporting hazards may be introduced. If these be successfully dealt with they do not assume hazardous shape. When they tax the creature's constitution beyond capacity, symptoms appear and a state of disease is established. The smooth functioning of the animal organism ceases abruptly at the slightest disturbance of balance between itself and environment. Disproportion or incongruity between these two essential factors in the universal life process is at once reflected in grotesque and incapacitating dysfunction.

It needs but a small variation, for example, in atmospheric pressure to produce that seriously crippling and painful condition known as "Bends." Similarly reduction of the oxygen partial pressure, as is well known to aviators and mountaineers, results in nausea and collapse. But it is likewise common knowledge that one man is less disturbed than another by these gaseous modifications. Such differences in reaction seem to depend upon the fact that the former individual possesses in the quality of his vital capacities, or natural constitution, the ability to adjust more successfully to the atmospheric changes than the latter. But we are accustomed to think of the dysfunction as being the direct result of either the total increased

pressure, or the oxygen want. This point of view is likewise held toward changes in the chemical or bacterial content of environment. But let us, on the other hand, consider the case of an Eskimo transported to a subtropical zone. His loss of appetite and weight and general decline of vigor may well reach a perilous degree. Our interest in these phenomena, however, would be directed chiefly at the outlandish individual; "He is not able to stand our climate" we would say, implying that the difficulty was with the man, not the climate. Actually, from a biological standpoint the disease phenomena of Bends and mountain sickness, as well as those of the transplanted Eskimo, express precisely the same mechanism. Both situations produce a disbalance between individual and environment. In the first instance the mountaineer, representing our conception of the average human being, is said to be the victim of enviromental change. Therefore, we concentrate on the changed environment and analyze samples of fresh and expired air. In the second instance the man, occupying our conception of proper environment, though he be as much the victim of it, becomes the major factor in the biological disproportion. In this more infrequent instance we take the environment for granted, and concentrate upon the unusual characteristics of the Man. We may also note, however, that just as in the case of mountaineers, some Eskimos stand the transplantation better than others.

THE PERSONIFICATION OF DISEASE

From all these postulates, then, we may logically support the notion that disease arises from the interplay of dynamic forces inherent in the individual and present in the world about him. It is a subtly moving, changing set of reactions between man and his environment, which cause him discomfort, or exactly what the world says, dis-ease. These discomforts, which have come to be called subjective symptoms, have so often been associated with certain outwardly visible or objective signs, that groupings of these observed phenomena have been described. The constancy of recurrence of such symptom combinations has gradually through the centuries resulted in the crystallization of mental concepts of this or that disease, named, for example, meningitis, pernicious anemia, or gastric ulcer. These imponderable concepts, vivified by fear and rendered organic by science, have become almost as fixed and solid as the physical entity of Man himself or one of his chemical or bacterial enemies. In such definite form a

disease seems almost to assume concrete personality, which with evil intent attacks the human being. Yet it is clear that a meningococcus is not in itself meningitis, that fell specter which in epidemic times is said to "stalk through the land." Nor is it possible to have meningitis except within the person of a human being. Viewed from this aspect it is easy to understand how strongly intrenched has become the tenet of the individuality of Disease. This position follows, perhaps, that ancient, and in the light of modern analytical psychology, illuminating quality of the mind of Man which seeks always in the environment for causes of his ills and failures; which places naively there, outside of himself, the responsibility for his discomforts. And the fixation of this thesis in the medical mind was rendered indelible for nearly two centuries by Sydenham's (3) forceful, though erroneous insistance upon the study of the Natural History of Disease.

But there are other very practical reasons why disease should have emerged in the medical consciousness as an entity in itself. Not the least of these is the obvious demand of suffering mortals for immediate relief from the enemy which holds them in its painful grip. "What devil has got me, Doctor?," cry the patients down the ages. And the doctor must gird his loins and grapple with that which has "got" him. This is a difficult task indeed, because the ability of physicians to understand and correct disease producing maladjustments will doubtless always fall far short of the demands put upon them. Another circumstance which has emphasized the personality of disease is the fact that quite naturally physicians are first of all concerned with the medical problems of limited localities. These problems comprise in general two types of disease, sporadic and epidemic; the former occupying their attention continually, the latter at intervals. But the effect of living in one commuhity, no matter what may be the size of its population, is for the modern doctor, as for the layman, productive of the same attitude toward their fellow citizens. It is not perhaps that familiarity in this case breeds contempt. But it leads him to take individuals for granted, to view his patient as "just another poor devil like everybody else, run into hard luck." And so he turns his microscope on the environment in his search for morbid agencies. This point of view has been passed on to the public, and their acceptance of it is well illustrated by the attitude of certain rural communities during the epidemic of acute poliomyelitis in 1916. Men armed with shot guns patrolled the approaches to villages, and barred the entrance of children under 16 years of age. These inno-

cents were thought to be the special, age determined, enemies who carried the virus-hazard which could perilously change the environment within the village and be responsible for the disease. No importance whatever was attached to the strange circumstance that in many families only one of the three, four or five children developed the malady; whereas in some others all the offspring succumbed. The implication that a special sort of child was as necessary as the specific virus for producing the disease was altogether disregarded. As a matter of fact the thesis of human specificity in this epidemic was supported by several definite observations, some made inadvertently by laymen, some by physicians. The former, for example, on visiting the wards of a poliomyelitis hospital almost invariably remarked upon the broad faced, large and healthy look of the children who had passed through the acute stage of the disease. By the doctors, for one thing, it was noted that there was a more or less wide separation of the central incisor teeth in 60 to 70 per cent of the afflicted children. Such, apparently slight, yet nevertheless suggestive facts, at first arouse the curiosity and finally compel us to study more intimately the quality of the individual patient.

RACIAL SUSCEPTIBILITY

In the past this is precisely what the best physicians did. Indeed the history of epidemics is full of references to striking divergencies in susceptibilities of races to certain infections. In 1854 James Bird (4) wrote that the negro was almost exempt from destructive fevers to which whites on the west coast of Africa are susceptible. And Livingstone (5), the explorer, in 1857 noted that "syphilis seemed incapable of permanence in any form in persons of pure African blood, but that in individuals of mixed bloods its ravages were severe." The suggestion that mixed races develop susceptibility of which pure types are incapable appears frequently in the history of epidemic disease. Perhaps it is an observation which holds valuable indication for the student of clinical genetics and likewise presents analogies to the varying susceptibilities of the hybrid phenotype. Such men as Addison, Laycock, and Jonathan Hutchinson in Great Britain, Sigaud in France and di Giovanni in Italy fully appreciated Hippocrates' teaching that men differed from one another in their perceptive powers and action capacities. They realized that knowledge of the patient was for the clinician a matter of equal, if not greater importance than any other factor in the disease problem. Perhaps too, lacking

adequate means for intimate study of environment, they were inevitably led to more searching inquiry into Man's nature. And so they became explorers in the jungles of disease, and made careful notes of the inhabitants they met on their journeys. They were able to recognize and describe in terms which we accept today as common knowledge the strange people whom they found amid the jungles of tuberculosis, pernicious anemia, or hereditary syphilis.

For clinicians of today, the nature of the problem is unchanged. We are still exploring the territories of disease, which are still inhabited by strange and peculiar people. But modern medical explorers, by virtue of better Scientific method and instruments of precision, have found the environment so greatly extended and intricate that their whole energy and attention has been absorbed by it. And so, latterly, they have brought home comparatively few reports about the inhabitants. But this situation is changing, thanks to the efforts of the many clinicians at work upon the study of Human Constitution. If there has appeared to be a somewhat slower assimilation into the main body of medical knowledge of the findings of the protagonists of Constitution study, which, after all, is but the natural history of *Homo sapiens*, it has depended not upon an unsound thesis, but upon lack of convincing methods. The unexplained and untransmissible "feelings" about patients and their diseases which the older clinicians amazingly possessed have commanded a diminishing respect during an epoch in which the exact technical procedures of chemistry, bacteriology, serology and physics have brought so much light to the bedside. Yet those ancient clinical intuitions are still as valuable as they ever were. But now, owing to new methods of analysis, we are in a position to examine their nature and their source, namely the total personality of the patient himself.

CLASSIFICATION BY DISEASE GROUPS

A practical need which must be met by natural historians is that of classification of the objects of their investigations. Consequently if physicians are to revive their studies of Man successfully some sort of classification scheme becomes essential. In a hybrid race, however, no fixed standard type of man or woman is available for a yard stick. But it is always possible to resort to the method of selecting individuals who possess a sufficient number of remarkable and similar characters to justify grouping them together. It is a matter of comparatively small moment what the criteria for such a classification

may be, provided only that they are constant and easily recognized. Now, disease, being the outstanding problem which faces the clinician, provides us at once with a fair basis for the classification of man. As was earlier suggested, disease is not an entity in itself, a monstrous affliction from without, but is rather the inevitable expression of conflict between unique individuality and an adverse specific environmental force. If this conception be sound, and if the attribute of unique susceptibility be a quality of the individual constitution, then a classification of Man into disease groups is a logical one. To illustrate the practical application of this attitude, reference may well be made to three patients with perforated gastric ulcer who lay at one time side by side in the Presbyterian Hospital. The likeness of the three, one to another, was striking; anthropometrically their measurements and proportions were almost superimposable. Nevertheless, these three men sprang from three distinct racial roots: one was an Anglo-Saxon, one a Pole from Middle Europe, one an Italian from the shores of the Mediterranean Sea. Obviously, these individuals, so similar in their morphology and in other attributes of personality, including a specific disease susceptibility, were not pure examples of their respective racial stocks. They were mixtures originating from widely different sources. Through the generations their antecedent germ plasm had received infusions of various strains in certain proportion until the three phenotypes appeared, practically identical not only in respect of their bodily and mental habitus, but also in their special disease potentialities.

It may well be that the conception of race as we have so far held it is no longer tenable. Undoubtedly the increasing facilities for migratory movements during the last two or three hundred years have forever shattered the biologic isolation of the subspecies of Man. Whether or not disease susceptibility as a criterion for grouping mankind will satisfy more than a temporary clinical need is a matter for discussion. Certain it is, however, that the preliminary studies of the psychologic panels of the different disease groups so far made suggest as wide a divergence in this phase as in the morphologic. Possibly for the moment reclassification of human beings on a disease potentiality basis will help to clear the blurring of differential characters which has resulted from extreme racial admixture. Furthermore, it would seem that the manner in which an individual relates himself to the social structure depends largely on his psychic pattern. Consequently, any method of study which clearly displays

psychological qualities may help in selecting the sort of life for which a given person is best fitted. Thus, a system of grouping based on disease potentiality serves a double purpose. On the one hand, its may well assist us to discover a man's specialized capacities for work, and, on the other, to preserve him for its accomplishment. For the physician, in any case, it is a useful arrangement.

GROWTH AND DEVELOPMENT

The question, therefore, to which we must address ourselves is briefly this: "What, then, is the Man himself?" At least he is something which has passed through a stage of growth and development. But it is hard to conceive that simply the provision of nutriment accounts for growth and development. Obviously without nourishment these phenomena would not take place. But there is something inherent in animal cells which drives them to divide, multiply and differentiate into special organs. Food alone cannot be presumed to do more than make possible the achievement of what may be called cell purposes. Furthermore, while food continues to be taken throughout life, growth, from the standpoint of augmentation in size or the building of other special organs, comes to a stop when maturity is reached. Yet while growth in the sense of augmentation ceases, cellular proliferation for the sake of replacement continues until the death of the whole organism. It is also true that throughout the growth and development stage, which is characterized by the most violent production of new tissue, necrobiotic processes are actively going on. But during this period there is a great preponderance of viabiotic over necrobiotic activity. Perhaps the course of life is roughly marked off into three epochs determined by the changing relationships of viabiotic to necrobiotic forces. Now the capacity which cells possess of growing and developing in a fashion characteristic of a given species is laid down in the genetic plan, and, so far as we now know, is passed on through the medium of the chromosomes. But adverse as well as useful environmental forces from the first play upon the new organism and immediately modify its character. Thus two sets of agencies are continuously at work modeling and remodeling the individual. Evidently then, at any given moment in its life, the thing which appears, the phenotype, is the up-to-the-instant result of hereditary forces distorted continuously from the start by environmental pressure.

But if perhaps during the past thirty years clinicians have turned more eagerly toward the environment the pathologists have continued, notwithstanding their ever widening field, to record observations of Man's structure. There is no more fascinating chapter in the book of pathology than that dealing, not with disease process, but with structural anomaly. These variations in form, either of an organ, a skeletal part, or the whole individual, have inevitably pinned the attention of pathologists on the variable potentialities of the human organism. Indeed, the point at which a structural variation becomes pathologic is as often a matter of degree as of kind. Thus, for example, a perfectly functioning lobulated kidney arrests the attention at necropsy quite as sharply as does the swollen or contracted and granular organ of nephritis; whereas double congenital polycystic kidneys, which may perform their task adequately for many years, are said to be pathologic only when they finally fail in the disproportionate balance between the aging individual and the increasing pressure of his environment. Moreover, very large or very small persons, who are accepted as normal variants of the racial type, are but a step removed from pathologic giants or dwarfs. Consequently, there is always passing under the eye of the pathologist material which must draw his thought toward the background which the individual himself supplies and which is essential to the pathologic process. In this respect the pathologist shares with the clinician continual opportunity to study and reflect upon the nature of Man. Many of the phenomena which appear to either group of observers express modifications of the growth and development processes. At least one mechanism by which certain growth faults arise has been ably demonstrated by Stockard (6), Newman (7) and others. The former showed that various types of double monsters could be produced by retarding the rate of development of the fertilized egg. As a result of his extensive studies, he concluded that all types of monsters (not hereditary) are the result of developmental arrests. Newman was able to produce certain types of monsters by hybridization. Obviously, then, structural anomalies of all sorts, whether sufficiently subversive of the vital balance to be termed pathologic or not, provide important material for the student of human growth and development.

The clinician likewise, in such conditions as giant hand or finger (localized overgrowth), acromegaly, gigantism, dwarfism, adiposity, incomplete twinning, and many others, may observe phenomena which throw light on the growth and development processes of what,

for want of a more accurate term, may be called the normal specimen. The foregoing conditions are well discussed by Hastings Gilford (8) and Keith (9). Obviously, growth and development, determined as they are by the joint action of heredity and environment, produce the phenotype. The success or failure which the latter achieves in adapting itself to environment expresses the quality of its constitution. Such observations as these inevitably lead us to a study of heredity as well as to the effects of environment on the immature individual.

CONSTITUTIONAL TYPES

Many criteria have been described by which the capacity of a given person's constitution might be judged. Thus, Hippocrates pointed out that people who lived in moist countries were fat, hairless, like women, and resisted disease poorly; whereas those who lived in colder, rockier regions were sleek and wiry and hardy. He says: "Some are hollow, and from broad contracted into narrow; some expanded, some hard and round, some broad and suspended, some stretched, some long, some dense, some rare and succulent, some spongy and of loose texture." Since then, under a variety of names the two basic examples of mankind, the long and the dense, have been heralded. Laymen have noted the importance of good color and eye light as indications of health. But observations of this kind deal entirely with the exterior of the body, its contours and proportions. Beneke (11) was among the first to point out that individuals possessing important structural anomalies in the arterial development rarely survived long. In 1632, Spigelius (12) described a ratio between intestinal and body length. As far back as 1765, de Haen (13) discussed the variation in position of internal organs in relation to disease. Later in a limited study of this character, Nacke (14) showed that in a series of cases of general paresis, there were greater and more frequent anomalies than were found in a control lot of non-paretic cases. Curiously enough, however, anomalies of the liver were more frequent in the non-paretic group. Treves (15), in 1886, drew attention to the difference between the intestinal lengths of carnivorous and herbivorous animals. He showed that in the former the intestine was short, and in the latter long and tortuous. These differences could be traced in sharply defined parallel through successive species down to the lowest orders. Treves believed that intestinal length thus provided a dependable means not only for classifying species, but also for demonstrating phylogenetic relationship. This

work was followed up by Bean (16), who correlated with intestinal length numerous observations on body form and disease propensity. These correlations formed the basis of his classifications of Mankind. In 1915, Bryant (17), also working on the difference in intestinal lengths, offered a classification of human beings on a morphologic basis, and pointed out somewhat similar disease correlations to those of Bean.

THE ANALYSIS OF PERSONALITY

So far it would appear that most of the studies of Man had been limited to his physical aspect and anatomical structure. But there have been quite as many recorded observations of his behavior and psychological qualities. The evolution of knowledge in this field has followed much the same course as that just described. What we refer to as the wisdom of the ancients is after all but the practical, empirical use of their intuitions and experiences of the human psyche. Just as in the case of the body, whose original genetic plan may be modified by the stress of physical or psychological environment out of all semblance to its predestined type, so the psychic traumata which children endure warp the gossamer fabric of their inherited emotional patterns. In the light of contemporary psychological interpretation the ancient saying that "the child is father to the man" assumes a new significance; and it appears more than ever true that "out of the mouths of babes and sucklings ye shall learn wisdom." Still further the growing knowledge of the mind parallels that of the body in respect of the importance to it of the study of those congenital mental anomalies, the idiots, morons, and hereditarily insane. The problem, however, of evaluating differences in the psychological personality of average or normal persons is far more difficult than recognizing their physical variations. Yet, notwithstanding their subtle and fleeting character, it has been the temperaments and moods, rather than the physical aspect of his fellows, which have always made the deepest and most lasting impressions on Man. It is not surprising, therefore, that the portrait by a great artist should leave a more poignant record than a photograph.

Space does not permit a detailed historical review of the development of methods which have been devised for studying the psychological panel of the total personality. But there are four quotations from the literature of the ages which have peculiar significance today. In the first, Hippocrates (18), writing of dreams, removes any doubt

that he recognized the two phases of the mind which are now known as conscious and unconscious.

> He who forms a correct judgement of those signs which occur in sleep, will find that they have a great efficacy in all respects; for the mind is awake when it ministers to the body, being distributed over many parts; it is not then master of itself, but imparts a certain portion of its influence to every part of the body, namely, to the senses, to the hearing, seeing, touch, walking, acting, and to the whole management of the body, and therefore its cogitations are not then in its own power. But when the body is at rest, the soul, being in a state of movement, steals over the organs of the body, manages its own abode, and itself performs all the actions of the body; for the body, being asleep, does not perceive, but the soul, being awake, beholds what is visible, hears what is audible, walks, touches, is grieved, reflects, and in a word, whatever the offices of the soul or body are, all these the soul performs in sleep. Whoever, then, knows how to judge of these correctly, will find it a great part of wisdom.

Next, Francis Bacon, in his essay on friendship, discourses upon the value of putting one's thoughts into words: "In a word," he writes, "a man were better to address himself to a statue or picture, than to suffer his thoughts to pass in smother." This passage displays Bacon's appreciation of the value of "free-association." There is something prophetic, too, of the statue-like, taciturn figure of the modern analyst, listening with impersonal and "chirurgische Kälte," to the verbal distillate of his patient's psychic content. And finally Nietzsche, discussing inspiration, points out the startling significance of symbols: "The spontaneity of the images and similes is most remarkable; one loses all perception of what is imagery and simile; everything offers itself as the most immediate, exact, and simple means of expression." (*Ecce Homo.*) And again:

> Here do all things come caressingly to thy discourse and flatter thee, for they would fain ride upon thy back. On every simile thou ridest here to every truth. Here fly open before thee all the speech and word shrines of existence, here all existence would become speech, here all becoming would learn of thee how to speak. (*Zarathustra.*)

Finally, in *The Birth of Tragedy* he writes:

> In our dreams we delight in the immediate apprehension of form; all forms speak to us, none are unimportant, none are superfluous.

It remained for the encyclopedic and poetic genius of Sigmund Freud to assimilate the thought implicit in such writings and build the structure of psychoanalysis. No matter what the critics of certain aspects of Freud's system of psychology may declare, there is no doubt

that the present rapidly expanding and intensive investigation of psychic mechanism in relation to disease owes its impulse to the work of the great Viennese. The disturbance of existing habits of thought caused by his utterances may be measured in the great amount of debate which they have raised. And the army of his followers and antagonists forms a vast array in which may be found many of the best intellects from every part of the world.

CONCLUSION

So far this discussion has dealt with the thesis that Man, like all other living organisms, possessing fine perceptive powers and action capacity, is constantly reacting with environment. It has also been suggested that those infinite variations in bodily form and function and psychic pattern which human beings display may be more or less accurately measured by proper methods of direct observation. But these purely analytical efforts leave us perhaps for the nonce in the rather embarrassed position of the king's horses and men before Humpty Dumpty's dismembered person. The key to the synthesis, however, at least so far as vital functions are concerned, seems to hang at the end of those vistas which have been opened by the work of Gaskell (19), Eppinger and Hess (20), Cannon, (21), Sherrington (22) and others. It may be that from the interplay of the autonomic nervous system, (that ancient device which links us inexorably with all other living creatures), the involuntary muscles and the endocrine glands, we shall ultimately derive the formula of individuality. Indeed there remains small doubt that the variety and color of personality is in some way related to these three elements. For it is upon them and through them that the emotions act. They seem, therefore, to be concerned with the transmutation of perception into action. But the differences and mutual variations between the perceptive powers and action capacity in different individuals are infinite. To strive to understand these innumerable shifting balancing factors, woven deep into the fabric of every cell, which ultimately find expression in the up-to-the-moment, completely realized individual—the phenotype—is a task worthy of the finest endeavor of the clinical explorer. And to be able to recognize and deal with the infinite variety and subtle degrees of internal response to similar environmental hazards which different individuals present, forms perhaps the therapeutist's major problem.

When the physician fixes his attention upon the study of Man, he becomes an anthropologist, and medicine, his province, no longer

limited to a study of the world about him, turns out in truth to be a portion of the science of anthropology. One is reminded of the mythical emperor of China, Shen Sung, who as the great healer of his day was perhaps one of the earliest practitioners in history. There is a portrait, of the Sage, showing him girt with ropes of herbs and minerals which he has collected throughout the earth for their medicinal virtues. But they have failed him, and, deep in thought, he walks beside a placid lake upon whose unruffled surface the moon's reflection rests. He reaches out his hands toward the mirrored image and exclaims "Ah, if only I could gather up the healing properties in the moon as well I would cure all of Man's ills." But notwithstanding this cry for more knowledge of the remote environment, and more equipment to deal with its effects, the legend implies that Shen Sung was first of all a wise philosopher, a master in the science and art of understanding his fellow men.

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NOTES

A NOTE ON THE MORTALITY OF BREWERY EMPLOYEES

Life insurance and official occupational mortality data usually indicate a high mortality rate for workers in breweries and distilleries. The conclusion is almost always drawn that this high mortality rate among such people is solely due to excessive drinking. Such a conclusion is not entirely warranted, because it takes no account whatever of *other* hazards incident to such occupations. And that such other hazards exist is certain. They include such things as continued exposure to abnormal temperatures and humidities, abnormal chemical composition of the air, and heavy physical exertion (lifting barrels, etc.).

Last spring I had an interesting letter from Mr. John Prechtl, the Secretary of Brewers Union No. 1, of New York City, in which he discussed the recent mortality exhibited among the members of his Union. As a result of the correspondence which ensued Mr. Prechtl finally placed in my hands complete data as to the age of each living member of the Union (508 men), and the mortality by ages over a period of two years forward from August 27, 1926.

Mr. Prechtl states in one of his letters that he has kept the records of the Union since 1917, and has known all of the members personally. He says they are "heavy beer drinkers."

Table 1 shows the total life-years exposure to risk covered in the experience, and the deaths, by ages.

Applying to the exposure to risk figures of Table 1 the age specific death rates (1000 q_x) values of Glover's life table for foreign-born white males, 1910, which are the closest available general population rates, considering that nearly all the persons in this experience are either Bohemians or Germans, it is found that the number of deaths which would be expected in this group of men over the time covered, if they had been subject to the same mortality rates that foreign-born white males were in 1910, is 25.0. The actually observed deaths in the group were also 25 in number. This is not merely good agreement. It is perfect. But accidents will occasionally happen, even in statistics!

Is the foreign-born white population of the entire registration area a fair basis of comparison for these brewery workers? Plainly it is not

precisely so, for a number of reasons. Perhaps the most important reason is that it includes all types of occupations, and by virtue of that fact takes no account of the hazards of industrial employment. Our brewery workers are engaged in an industrial employment which involves a number of special and rather severe health hazards, in addition to the alcohol consumption, if we regard the latter as a hazard. If we apply to the exposure-to-risk figures of Table 1 the rates of the Standard Industrial Mortality Table, which is stated by Glover (p. 225) to have "been adopted as the legal basis for industrial insurance in the state of New York," we find that the expected deaths in this group of brewery workers would have been 29.5, as against the observed 25.

TABLE 1

Mortality Experience over Two Years of the United Brewery Workers of America, Union No. 1 (New York)

Age classes	Life-years exposure to risk	Deaths
15–19	3	
20–24	8	
25–29	16	
30–34	43.5	
35–39	81.5	
40–44	165	1
45–49	212.1	2
50–54	156.7	2
55–59	149.5	3
60–64	109.5	6
65–69	52.3	8
70–74	33	
75–79	3.8	2
80–84	1.7	1
Totals.....	1035.6	25

On this basis the brewery workers made a distinctly more favorable showing than industrial workers in general. But again the comparison is not entirely fair because the Standard Industrial rates are based on the experience of 1896–1905, and death rates in general have fallen since then.

To sum up, it may fairly be said, I think, that the foreign-born white male experience of 1910 under-estimates the number of deaths

to be expected in a group of workers in a hazardous industry at the present time, and the Standard Industrial Mortality Table overestimates it. It seems reasonably certain, taking all the available evidence into account, that this group of brewery workers, in the two years of experience here covered, exhibited no evidence of a significant excess mortality, in spite of the fact that the individuals included had been heavy beer drinkers throughout their adult lives.

RAYMOND PEARL

QUOTATIONS

MR. CRANIUM'S LECTURE

The following quotation, which is the major portion of Chapter XII of Thomas Love Peacock's *Headlong Hall*, will certainly be found entertaining by our readers, we venture to think. Perhaps also it is not without deeper significance for the detached student of the methodology of the rapidly growing science of human biology. There seems to be a certain fundamental similarity between Mr. Cranium's modes of reasoning and those currently fashionable in some fields of biological endeavor. *Headlong Hall* was first published in 1816.

The setting of this quotation is that Squire Headlong invited a group of *intelligentsia* to Headlong Hall for a Christmas party. Among the guests was Mr. Cranium, who was an ardent amateur craniologist. One evening at dinner, after the cloth had been removed, and the bottle had taken its first round, Mr. Cranium invited the guests to attend a lecture which he would shortly deliver. The invitation was couched in the following language: "'Ladies and gentlemen,' said he, 'the golden key of mental phenomena, which has lain buried for ages in the deepest vein of the mine of physiological research, is now, by a happy combination of practical and speculative investigations, grasped, if I may so express myself, firmly and inexcussibly, in the hands of physiognomical empiricism.' The Cambrian visitors listened with profound attention, not comprehending a single syllable he said, but concluding he would finish his speech by proposing the health of Squire Headlong. The gentlemen accordingly tossed off their heel-taps, and Mr. Cranium proceeded: 'Ardently desirous, to the extent of my feeble capacity, of disseminating, as much as possible, the inexhaustible treasures to which this golden key admits the humblest votary of philosophical truth, I invite you, when you have sufficiently restored, replenished, refreshed, and exhilarated, that osteosarchaematos-planchnochondroneuromuelous, or to employ a more intelligible term, osseocarnisanguineoviscericartilaginonervomedullary, *compages*, or shell, the body, which at once envelops and develops that mysterious and inestimable kernel, the desiderative, determinative, ratiocinative, imaginative, inquisitive, appetitive, comparative, reminiscent, con-

geries of ideas and notions, simple and compound, comprised in the comprehensive denomination of mind, to take a peep with me into the mechanical arcana of the anatomicometaphysical universe. Being not in the least dubitative of your spontaneous compliance, I proceed,' added he, suddenly changing his tone, 'to get everything ready in the library.' Saying these words, he vanished."

Here is the lecture which, after a short interval, followed:

"Physiologists have been much puzzled to account for the varieties of moral character in men, as well as for the remarkable similarity of habit and disposition in all the individual animals of every other respective species. A few brief sentences, perspicuously worded, and scientifically arranged, will enumerate all the characteristics of a lion, or a tiger, or a wolf, or a bear, or a squirrel, or a goat, or a horse, or an ass, or a rat, or a cat, or a hog, or a dog; and whatever is physiologically predicted of any individual lion, tiger, wolf, bear, squirrel, goat, horse, ass, hog, or dog, will be found to hold true of all lions, tigers, wolves, bears, squirrels, goats, horses, asses, hogs, and dogs whatsoever. Now, in man, the very reverse of this appears to be the case; for he has so few distinct and characteristic marks which hold true of all his species, that philosophers in all ages have found it a task of infinite difficulty to give him a definition. Hence one has defined him to be a *featherless biped*, a definition which is equally applicable to an unfledged fowl; another, to be *an animal which forms opinions*, than which nothing can be more inaccurate, for a very small number of the species form opinions, and the remainder take them upon trust, without investigation or inquiry.

"Again, man has been defined to be *an animal that carries a stick:* an attribute which undoubtedly belongs to man only, but not to all men always; though it uniformly characterises some of the graver and more imposing varieties, such as physicians, oran-outangs, and lords in waiting.

"We cannot define man to be a reasoning animal, for we do not dispute that idiots are men; to say nothing of that very numerous description of persons who consider themselves reasoning animals, and are so denominated by the ironical courtesy of the world, who labour, nevertheless, under a very gross delusion in that essential particular.

"It appears to me, that man may be correctly defined an animal, which, without any peculiar or distinguishing faculty of its own, is, as it were, a bundle or compound of faculties of other animals, by a distinct enumeration of which any individual of the species may be satisfactorily described. This is manifest, even in the ordinary language of conversation, when, in summing up, for example, the qualities of an accomplished courtier, we say he has the vanity of a peacock, the cunning of a fox, the treachery of an hyaena, the cold-heartedness of a cat, and the servility of a jackal. That this is perfectly consentaneous to scientific truth, will appear in the further progress of these observations.

"Every particular faculty of the mind has its corresponding organ in the brain. In proportion as any particular faculty or propensity acquires paramount activity in any individual, these organs develop themselves, and their development becomes externally obvious by corresponding lumps and bumps, exuberances and protuberances, on the osseous compages of the occiput and sinciput. In all animals

but man, the same organ is equally developed in every individual of the species; for instance, that of migration in the swallow, that of destruction in the tiger, that of architecture in the beaver, and that of parental affection in the bear. The human brain, however, consists, as I have said, of a bundle or compound of all the faculties of all other animals; and from the greater development of one or more of these, in the infinite varieties of combination, result all the peculiarities of individual character.

"Here is the skull of a beaver, and that of Sir Christopher Wren. You observe, in both these specimens, the prodigious development of the organ of constructiveness.

"Here is the skull of a bullfinch, and that of an eminent fiddler. You may compare the organ of music.

"Here is the skull of a tiger. You observe the organ of carnage. Here is the skull of a fox. You observe the organ of plunder. Here is the skull of a peacock. You observe the organ of vanity. Here is the skull of an illustrous robber, who, after a long and triumphant process of depredation and murder, was suddenly checked in his career by means of a certain quality inherent in preparations of hemp, which, for the sake of perspicuity, I shall call *suspensiveness*. Here is the skull of a conqueror, who, after over-running several kingdoms, burning a number of cities, and causing the deaths of two or three millions of men, women, and children, was entombed with all the pageantry of public lamentation, and figured as the hero of several thousand odes and a round dozen of epics; while the poor highwayman was twice executed—

> 'At the gallows first, and after in a ballad,
> Sung to a villanous tune.'

You observe, in both these skulls, the combined development of the organs of carnage, plunder, and vanity, which I have separately pointed out in the tiger, the fox, and the peacock. The greater enlargement of the organ of vanity in the hero is the only criterion by which I can distinguish them from each other. Born with the same faculties, and the same propensities, these two men were formed by nature to run the same career: the different combinations of external circumstances decided the differences of their destinies.

"Here is the skull of a Newfoundland dog. You observe the organ of benevolence, and that of attachment. Here is a human skull, in which you may observe a very striking negation of both these organs; and an equally striking development of those of destruction, cunning, avarice, and self-love. This was one of the most illustrious statesmen that ever flourished in the page of history.

"Here is the skull of a turnspit, which, after a wretched life of *dirty work*, was turned out of doors to die on a dunghill. I have been induced to preserve it, in consequence of its remarkable similarity to this, which belonged to a courtly poet, who have grown grey in flattering the great, was cast off in the same manner to perish by the same catastrophe."

After these, and several other illustrations, during which the skulls were handed round for the inspection of the company, Mr. Cranium proceeded thus:

"It is obvious, from what I have said, that no man can hope for worldly honour or advancement, who is not placed in such a relation to external circumstances as may be consentaneous to his peculiar cerebral organs; and I would advise every

parent, who has the welfare of his son at heart, to procure as extensive a collection as possible of the skulls of animals, and, before determining on the choice of a profession, to compare with the utmost nicety their bumps and protuberances with those of the skull of his son. If the development of the organ of destruction point out a similarity between the youth and the tiger, let him be brought to some profession (whether that of a butcher, a soldier, or a physician, may be regulated by circumstances) in which he may be furnished with a license to kill: as, without such license, the indulgence of his natural propensity may lead to the untimely rescission of his vital thread, 'with edge of penny cord and vile reproach.' If he show an analogy with the jackal, let all possible influence be used to procure him a place at court, where he will infallibly thrive. If his skull bear a marked resemblance to that of a magpie, it cannot be doubted that he will prove an admirable lawyer; and if with this advantageous conformation be combined any similitude to that of an owl, very confident hopes may be formed of his becoming a judge."

R. P.

EUGENICS CIRCA 590 B.C.

The following quotation from Theognis of Megara, written about 590 B.C. is one more bit of evidence either of the modernity of the ancient Greeks, or of the slight progress that has been made in the evolution of ideas in 2500 years.

Theognis was a writer of elegiac poetry. York Powell thought him "a great and wise man." The bit quoted here is from one of the elegies to his young friend Cyrnus, which were mainly devoted to advice as to the conduct of life. Plato, Xenophon, and Aristotle regarded Theognis' ethical writings highly. Theognis was, in general, a rather uncompromising believer in nature as against nurture. Plato quotes him on this matter in Meno. Socrates points out in this dialogue that Theognis took the position that "if wisdom could be made and placed in man" the persons who were able to accomplish this "many and great rewards would carry off;" and goes on to quote with approval:

> From a good sire no bad son e'er would come,
> To words of wisdom listening; but thou'lt ne'er
> By teaching make the bad a virtuous man.

There is an English translation of the 1400 lines of Theognis' writings preserved to us, in Bohn's Classical Library (1856).

The translation of the following quotation was made by W. R. P. Davey, Professor of Greek in Syracuse University.

We seek, Cyrnus, for rams and asses and horses that are wellborn, and everyone wishes them to spring from good stocks. But a nobleman does not mind marrying a baseborn woman of a baseborn house, if she brings him much money. Nor does a woman decline to be wife of a baseborn man who is rich, but desires a wealthy man instead of a man of good stock. For they honor money. A nobleman takes to wife a woman from a baseborn house, and a baseborn man a woman from a house of good stock. Wealth has made the race impure. So do not wonder, Polypaides, that the race of our citizens is obscure, for nobleness with baseness is commingled.

W. M. SMALLWOOD

SYRACUSE UNIVERSITY

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CONTENTS

FOREWORD. *Raymond Pearl* 1

IS THE APE-MAN A MYTH? *Henry Fairfield Osborn.* 4

STUDIES ON CONSTITUTION. I. METHODS. *Raymond Pearl, Alan C. Sutton, William T. Howard, Jr., and Margaret G. Rioch* 10

ENTRENCHED NEGRO PHYSICAL FEATURES. *T. Wingate Todd* 57

DO RACES DIFFER IN MENTAL CAPACITY? *C. B. Davenport* 70

THE SEX FACTOR IN INFANT MORTALITY. *Harry Baldwin* 90

BIOLOGICAL PHILOSOPHY AND MEDICINE. *George Draper* 117

NOTES. *A Note on the Mortality of Brewery Employees* 136

QUOTATIONS. *Mr. Cranium's Lecture. Eugenics Circa 590 B. C.* 139

RECENT LITERATURE 144

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